THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXXVII. No. 2148.] LONDON, JULY 12, 1904. [56TH YEAR. PRICE 6d.

PARKER & LESTER,

— *ESTABLISHED 1830.* —

MANUFACTURERS AND CONTRACTORS, **ORMSIDE STREET, LONDON, S.E.**

THE ONLY MAKERS OF

PATENT ANTIMONY PAINT & PARKER'S IMPERIAL BLACK VARNISH.

OXIDE PAINTS, OILS, AND GENERAL STORES, FOR GAS AND WATER WORKS.

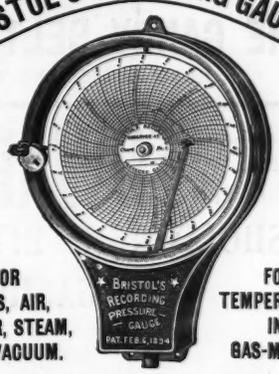
SAFETY GAS-MAIN STOPPER.

FOR SHUTTING OFF GAS IN MAINS TEMPORARILY DURING ALTERATIONS AND REPAIRS.

GAS-LEAK INDICATOR.

PRICES AND PARTICULARS ON APPLICATION.

BRISTOL'S RECORDING GAUGES



FOR GAS, AIR, WATER, STEAM, OR VACUUM.

FOR TEMPERATURE IN GAS-MAINS.

Many Thousands in Daily Operation.

J. W. & C. J. PHILLIPS,
23, COLLEGE HILL,
LONDON, E.C.

All Pipes marked

"S.A.V."

Telegrams: "AMOUR, LONDON."
Telephone Nos.: 1890 HOLBORN; CENTRAL 194.

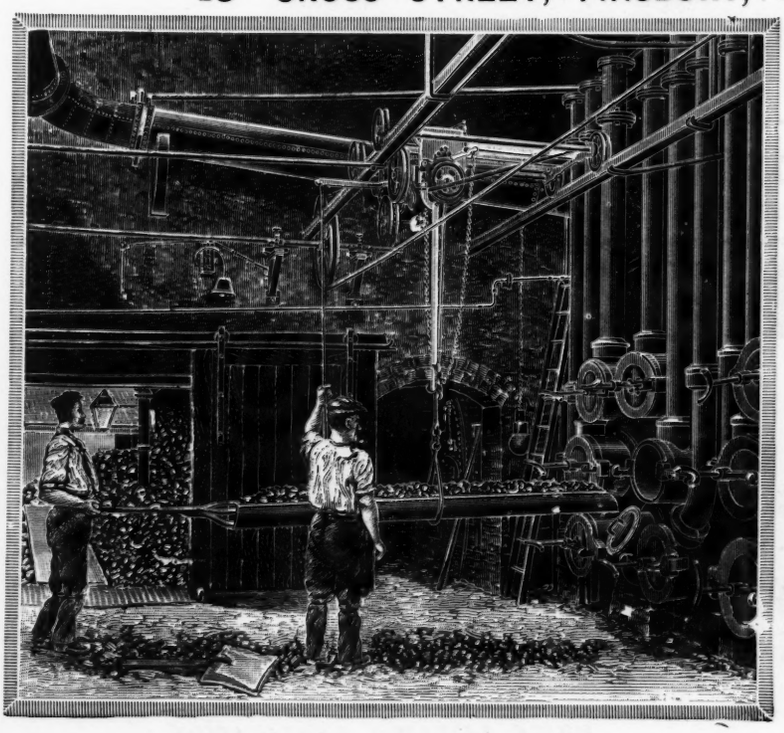
VERTICALLY CAST IRON PIPES.

The only Foundry in Europe casting Pipes under Clarifying Process.

A. G. CLOAKE,
54, HOLBORN VIADUCT, LONDON, E.C.

BIGGS, WALL, & CO.,

13 CROSS STREET, FINSBURY, LONDON, E.C.



Telegrams: "RAGOUT, LONDON."
Telephone: 273 CENTRAL.

"RAPID"
MANUAL & POWER
CHARGING APPARATUS,
FOR GAS-WORKS OF ALL SIZES.

Repeat Orders
YEOVIL, NEWPORT, SOUTHBANK, WORTHING, ALDERSHOT.

Machines can be seen working at any of the following Works:—

ALDERSHOT	WREXHAM
WORTHING	SWINDON
YEOVIL	EPSOM
TRURO	SHETTLESTON
NORMANTON	DUBLIN
OTLEY	G. S. & W. Rly. Works
GOOLE	NEWPORT, MON.

GANDY'S BELTING

Holds the World's Record! 41 Prize Awards!

IN A WATER-GAS PLANT, an important item is the Belt for driving the Blower. Ours are specially constructed **Endless Belts,** and have acquired a reputation for this special Work.

CONVEYOR BELTING—A SPECIALITY.

THE GANDY BELT MANUFACTURING COMPANY, LTD.,

HEAD OFFICES AND WORKS—SEACOMBE, LIVERPOOL.

This Trade Mark may be seen stencilled on every genuine "Gandy" Belt.

Telegrams: "COCKEYS, FROME."

EDWARD COCKEY & SONS, LTD.,

Telegrams: "DAMPER, LONDON."

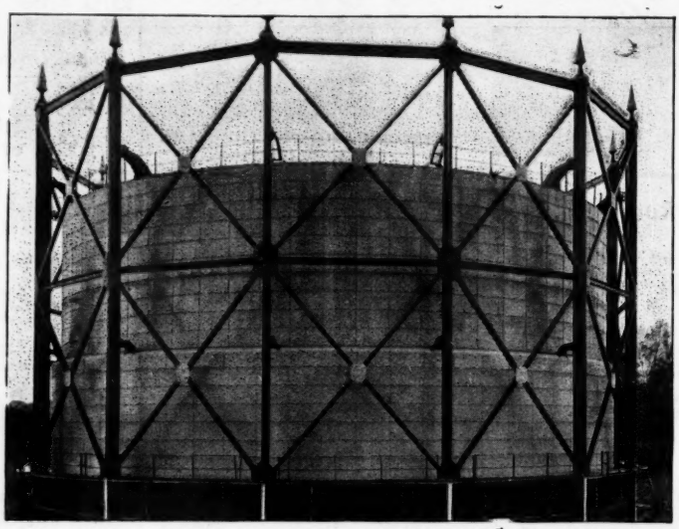
GASHOLDERS IN EITHER STEEL OR WROUGHT IRON.

GASHOLDER TANKS IN STEEL, WROUGHT OR CAST IRON.

CAST-IRON COLUMNS.

STEEL or WROUGHT IRON STANDARDS. *(Any Section.)*

INLET and OUTLET PIPES in either CAST or WROUGHT IRON, or STEEL.



HYDRAULIC MAINS.
FOUL MAINS.
CONDENSERS.
RETORT-LIDS.
PURIFIERS.
HYDRAULIC LIFTS.
ROOFS.
BOILERS in either WROUGHT IRON or STEEL.

LAMP COLUMNS, MAIN PIPES, and IRREGULARS always in Stock

THE IRON-WORKS, FROME, SOMERSET.

London Office: 181, QUEEN VICTORIA STREET, E.C. *BALE & HARDY, Agents.*

D. HULETT & CO., LTD.

55 & 56, High Holborn, London.

GAS SERVICE CLEANSERS.

LAMP TORCHES.

DRY GAS-METER MAKERS.

WROUGHT-IRON TUBES & FITTINGS.

STREET LAMPS & POSTS.

PRICE LISTS ON APPLICATION.

THE BARROWFIELD IRON-WORKS, LIMITED,

GAS ENGINEERS & CONTRACTORS,

Telegrams: "GASOMETER GLASGOW."

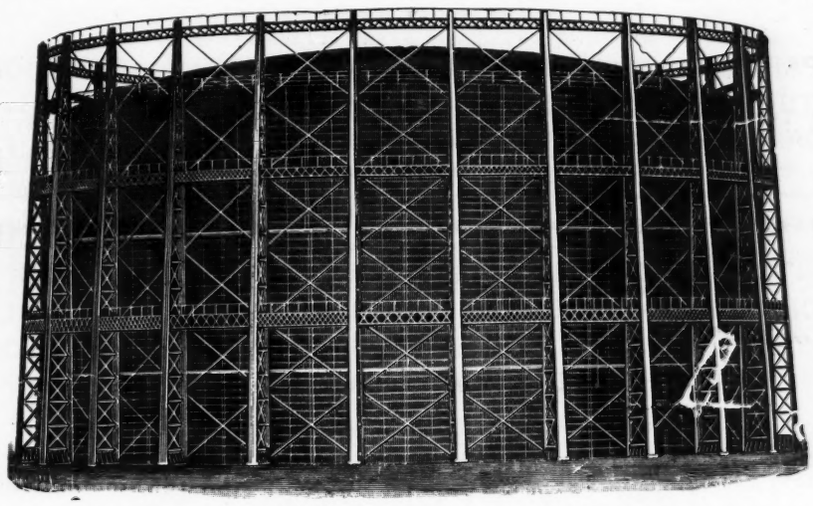
GLASGOW.

OIL PLANT AND CHEMICAL APPARATUS.

BRIDGES, GIRDERS, WHARVES, PIERS.

ROOFING OF EVERY STYLE.

PIPES VALVES, AND CONNECTIONS.



GAS APPARATUS OF EVERY DESCRIPTION.

RETORTS, CONDENSERS, SCRUBBERS, PURIFIERS.

GASHOLDERS AND TANKS.

ENGINES, EXHAUSTERS, STEAM BOILERS, AND FITTINGS.

THREE-LIFT GASHOLDER. Capacity, SIX MILLION cubic feet.
240 feet Diameter by 45 feet Deep each Lift. Erected at Glasgow, 1893.

London Office: 6, LITTLE BUSH LANE, CANNON STREET.

GEORGE ORME & CO. (Branch of Meters Ltd)

ATLAS METER WORKS,

PARK STREET, OLDHAM.

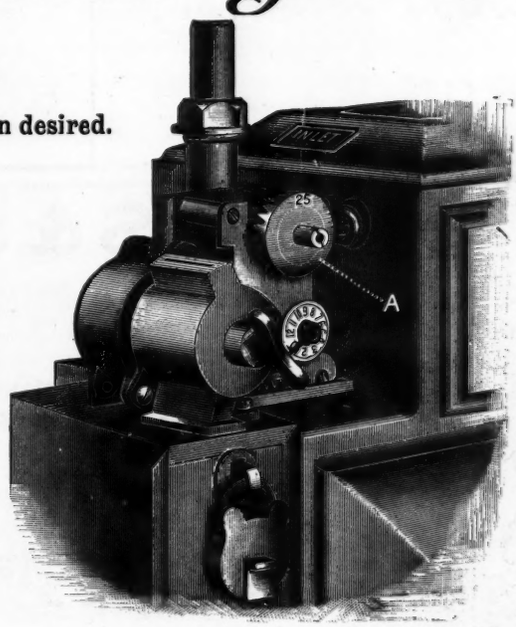
Tel. Address: "ORME OLDHAM."
Telephone No. 93 Oldham.

"NEW CENTURY" PATTERN

Patent Coin Prepayment Gas-Meters

Fitted with Detachable Attachments.

Arranged for 1d., 1s., or any other Coin desired.



Change of Price effected by simply removing Crown Wheel "A" and replacing same with another Wheel.

ANY FURTHER PARTICULARS WILL BE SUPPLIED UPON APPLICATION.

NEWTON, CHAMBERS, & CO.,

LIMITED,

THORNCLIFFE IRON-WORKS, NEAR SHEFFIELD.

Established 1790

LONDON OFFICE: 19, Great George Street, WESTMINSTER.

Telegraphic Addresses: "NEWTON, SHEFFIELD," "ACCOLADE, LONDON."

GAS ENGINEERS IRONFOUNDERS, & CONTRACTORS.

MANUFACTURERS OF EVERY DESCRIPTION OF

PLANT, APPARATUS, AND MACHINERY FOR GAS AND CHEMICAL WORKS.
RETORTS AND FITTINGS, MOUTHPIECES WITH SELF-SEALING LIDS.
IMPROVED COAL AND COKE HANDLING PLANT CONVEYORS AND ELEVATORS.
CONDENSERS, SCRUBBERS, AND WASHERS.

PURIFIERS with Planed Joints a Speciality.

PATENT CENTRE-VALVES, RACK AND SCREW VALVES, WOOD GRIDS AND SCRUBBER-BOARDS, CAST-IRON MAINS, AND SPECIALS.
STRUCTURAL WORK, COLUMNS, GIRDERS, AND ROOFING.
GASHOLDERS, CAST-IRON OR STEEL TANKS.

DESIGNS, SPECIFICATIONS, and ESTIMATES FREE.

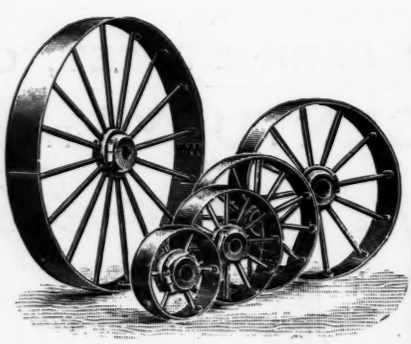
PIG IRON (SPECIAL QUALITY) for Engine Cylinders. GAS COAL famous for its unrivalled excellence.

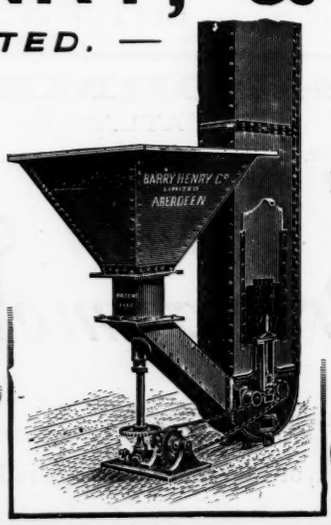
BARRY, HENRY, & CO.,

— LIMITED. —

Specialities:
TRANSMISSION OF POWER.
Rope & Belt Pulleys,
Spur & Bevel Wheels,
Shafting & Couplings,
Pedestals, & Fixings.

WORKS:
ABERDEEN, SCOTLAND.





Specialities:
TRANSMISSION OF MATERIALS.
Conveyors
Elevators,
Grinding Machinery,
Motors.

AND
64, MARK LANE, LONDON, E.C.

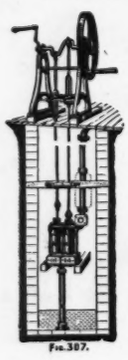
JOSEPH EVANS & SONS, CULWELL WORKS, WOLVERHAMPTON.

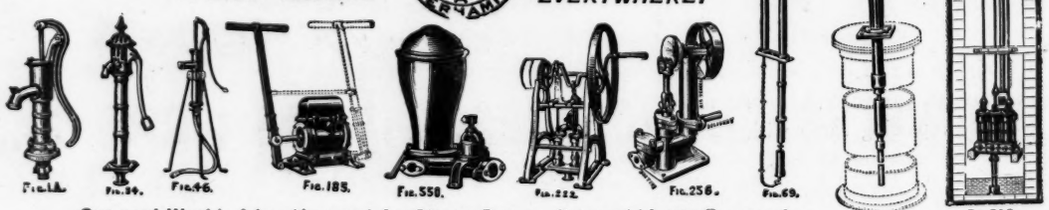
London Address:
Salisbury House, London Wall, London, E.C.

PLEASE APPLY FOR CATALOGUE No. 8.

TRADE MARK.
FIRST AWARDS EVERYWHERE.

Telegrams:
"EVANS, WOLVERHAMPTON."
National Telephone No. 7099.





See next Week's Advertisement for Steam-Pumps, Tar and Liquor Pumps, &c.

WELSBACH KERN

THREE-BURNER HOT-PLATE.

Each Burner of Varying Power.

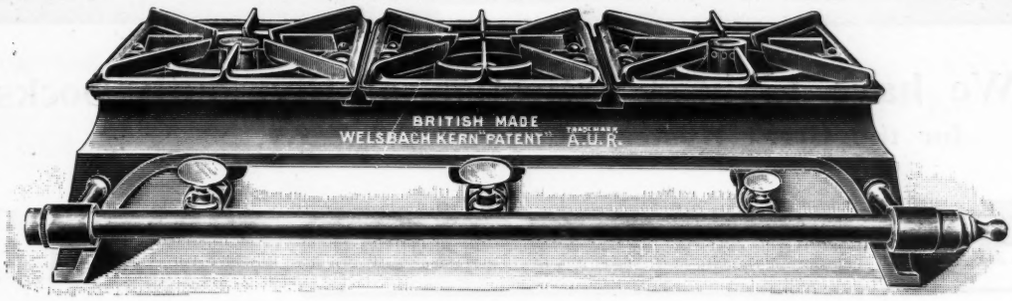


Fig. 2.—Open.

Fig. 1.—Closed.

Write for full Catalogue of WELSBACH and KERN COOKERS, GRILLERS, BOILERS, HOT-PLATES, IRONING-STOVES, &c.

THE WELSBACH INCANDESCENT GAS LIGHT CO., LTD.,

2-14, Palmer Street, Westminster, London, S.W.

Telegrams: "WELSBACH, LONDON." Telephone: 290 WESTMINSTER.

THIS TALKS!!!

We have Lighted a Section of Plymouth Docks
for the Great Western Railway Company.

An Extension has been Ordered. .

We have completed at Aylesbury an Installation—Town Hall, Market, &c. .

The Council has unanimously decided that we be requested to do the whole of the Public Lighting.

We are

50 per cent. Cheaper than Incandescent Gas.
70 ,, Electric Arc.
80 ,, ,, Incandescent.
120 ,, Ordinary Fishtail.

BERLIN, the Finest Lighted City in the World, **has adopted Millennium**

It is the **LAST WORD.**

THE MILLENNIUM SYSTEM IS A METHOD OF COMPRESSING ORDINARY GAS. . . . .

If you want to get **MORE LIGHT** and **CUT THE COST**, write—

The British Compressed Gas Co., Ld.,

57, BARBICAN, E.C.

ARROL-FOULIS

Patent Automatic Machinery

FOR

DRAWING AND CHARGING GAS-RETORTS.

Full Particulars may be obtained from the Sole Makers.

SIR WILLIAM ARROL & CO., Limited,

GLASGOW.

[See Illustrated Advertisement, July 5, p. 70.]

LARGEST MANUFACTURERS in the UNITED KINGDOM

of GAS-RETORTS,

Horizontal or Inclined; also Makers of Segmental Retorts of all Sections.

PATENTEES OF

Machine-Flanged RETORTS.

B. GIBBONS, JR., LD.

TELEPHONE DUDLEY NO. 10.

DIBDALE WORKS, **DUDLEY.**

Telegraphic Address: MACHINE, LOWER GORNAL.

SPECIAL BRICKS & BLOCKS of every description for GENERATOR and REGENERATOR FURNACES.

Large Stocks of Bricks of all sizes, Burrs, Boiler Seating Blocks and Covers, Plain and Rebated Tiles, &c., &c.

"ABC" Code and UNICODE used for Telegrams and Cablegrams.

B. Retorts and other Fire-Clay Goods carefully packed for export.

FOREIGN AND HOME COPIES OF ILLUSTRATED CATALOGUES ON APPLICATION.

THE LEEDS FIRECLAY CO., LTD.

JOSEPH CLIFF & SONS' BRANCH.

Cliff's Wortley Silica Bricks.

FOR Arches and Crowns where high heats are required. They contain over 90 per cent. of Silica, and are nearly stationary under the influence of heat, swelling a little rather than contracting. They are not like a Gannister or Dinas Brick, but a Fire-Brick of a highly Silicious nature.

Cliff's Wortley Aluminous Bricks.

THESE are for Side Walls where great wear and tear takes place. Are made of a specially prepared mixture, are high in Alumina, and are what is termed a HARD FIRE-BRICK.

BALTIC WHARF, WATERLOO BRIDGE, LONDON, S.E.

Liverpool: Leeds Street. **Leeds: Queen Street.**

Gasholders

PURIFIERS

Retort Ironwork

SCRUBBERS

Condensers

WASHERS

Valves

MAINS

Ammonia Recovery Plant

STEEL TANKS

Steel Structures

ASHMORE, BENSON, PEASE, & CO., LTD.,

Stockton-on-Tees.

Telegrams: "GASHOLDER."

J. FIRTH BLAKELEY & CO.,

Telegrams:—
"BLAKELEY THORNHILL LEES."

Gas Engineers and Contractors,

THORNHILL, DEWSBURY.

"BLAKELEY'S"

Patent Rectangular Vertical

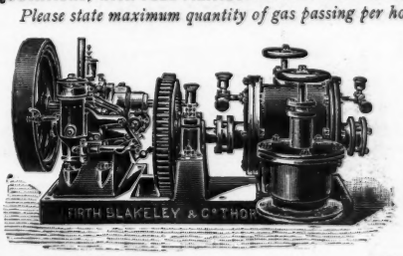
CONDENSERS,

Having Perforated Baffle Plates with Water-spreading and Cooling Arrangement.

These Condensers are already in use at several Gas-Works, and are giving every satisfaction.

QUOTATIONS, WITH FULL PARTICULARS AND DRAWINGS, SENT ON APPLICATION.

Please state maximum quantity of gas passing per hour, when enquiring.



'BLAKELEYS' IMPROVED COMBINED GAS ENGINE AND EXHAUSTER,

Specially designed to meet the requirements of small Gas-Works.

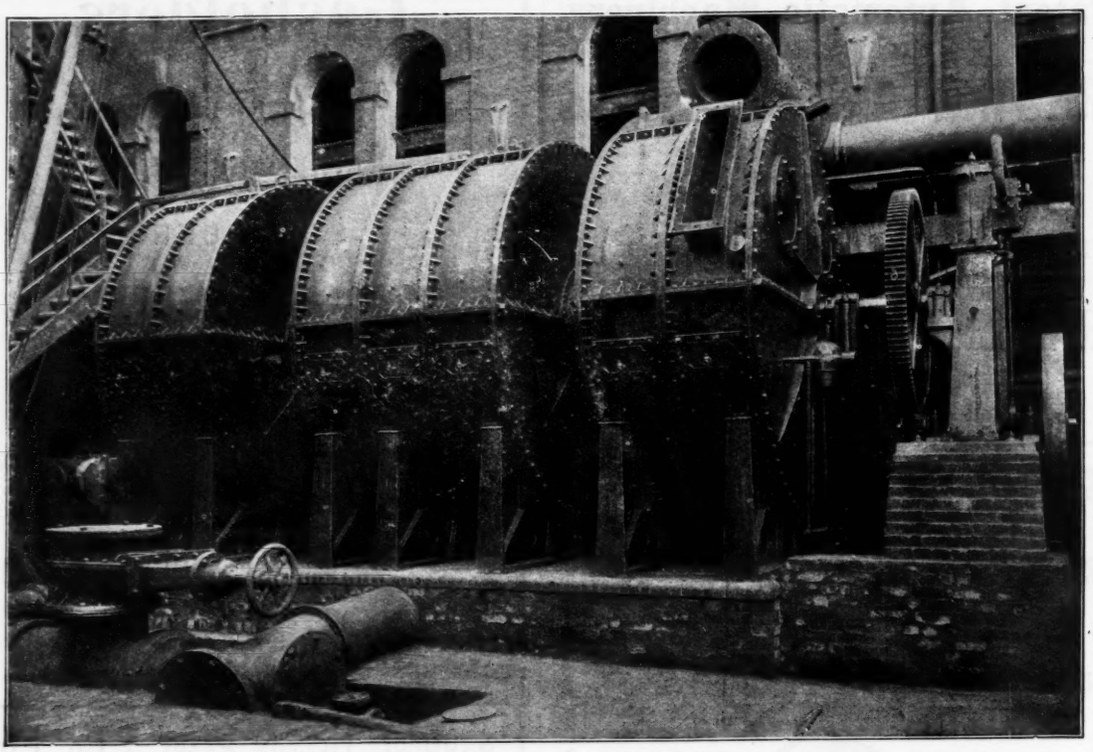
NO STEAM BOILER REQUIRED.
WEAR AND TEAR REDUCED.
MORE GAS OBTAINED FROM EACH TON OF COAL.

Full Specification, Drawings, and Quotations on application.

KIRKHAM, HULETT, & CHANDLER, LTD.

PALACE CHAMBERS, BRIDGE ST., WESTMINSTER, S.W.

Extracts ALL the Ammonia and large proportion of CO_2 and H_2S.



Maximum Washing Surface. Easy access to Bearings and Interior.

IMPROVED PATENT "STANDARD" WASHER-SCRUBBER.

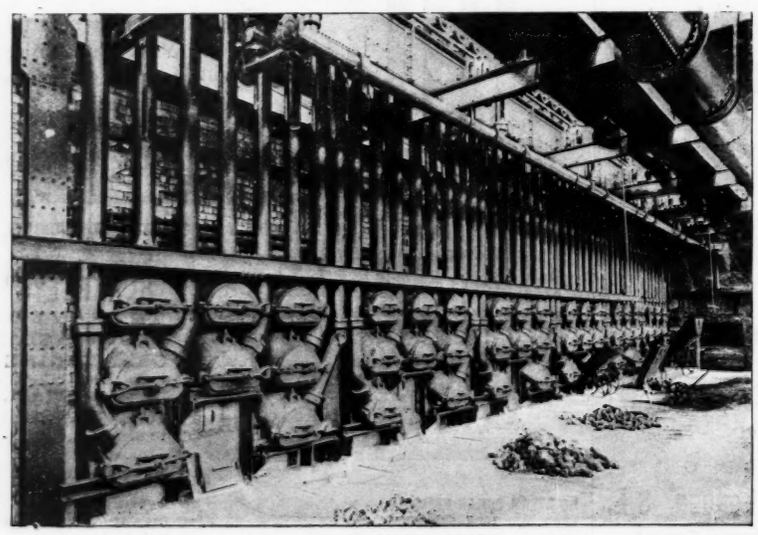
Telegraphic Address: "WASHER, LONDON."

Telephone No. 127 VICTORIA.

INSTALLATIONS OF INCLINED RETORTS COMPLETE.

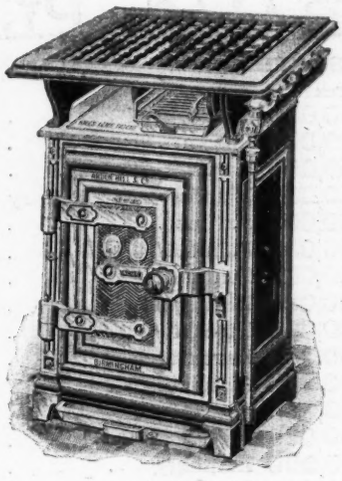
DRAKES LTD.

HALIFAX. *Telegrams:* "DRAKESON, HALIFAX." *Telephone:* "No. 43 HALIFAX."



COAL AND COKE BREAKING, ELEVATING, CONVEYING, SCREENING, PLANTS.

LONDON:
181, QUEEN VICTORIA ST., E.C.
NEW YORK:
395, BROADWAY.



The
"ACME"
on Hire

MAKES BUSINESS BOOM.

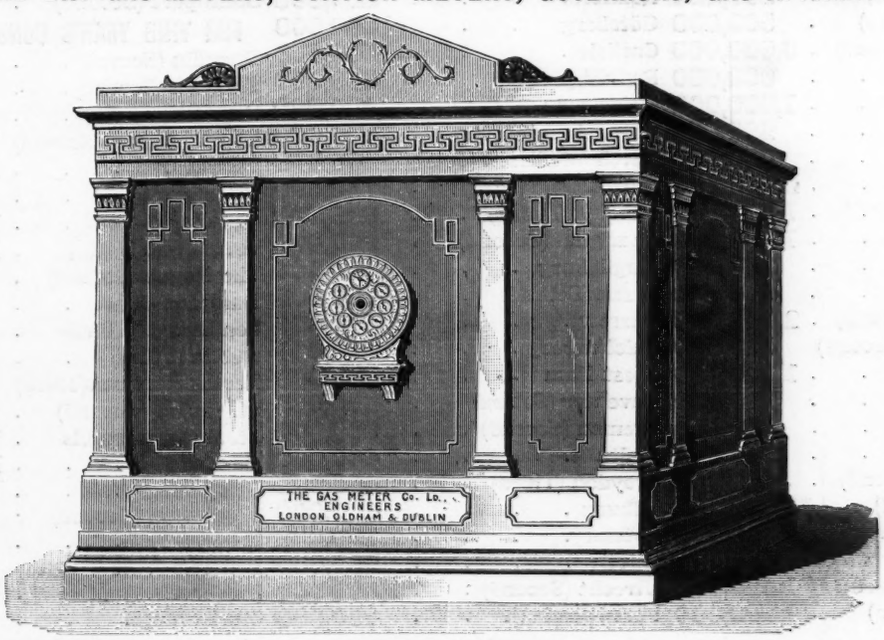
ARDEN HILL & CO., "ACME" WORKS, SALFORD STREET, BIRMINGHAM.

THE GAS-METER COMPANY,

MANUFACTURERS OF

WET AND DRY GAS-METERS, STATION METERS, GOVERNORS, GAS APPARATUS, ETC.

SQUARE STATION METERS WITH PLANED JOINTS.



STATION METERS IN CYLINDRICAL CASES.

DESIGN No. 2 PATTERN.

STATION METERS MADE AT THE COMPANY'S WORKS, OLDHAM (Late WEST & GREGSON). Established 1830.

For Prices and Particulars apply

F. W. CHURCH, Secretary.

Works: 238, KINGSLAND ROAD, LONDON; UNION STREET, OLDHAM; HANOVER STREET, DUBLIN.

Telegraphic Addresses: "METER LONDON." "METER OLDHAM." "METER DUBLIN." "METER MANCHESTER."

Telephone Nos.: 142 Dalston (Nat.); 340 Oldham (Nat.); 1995 Dublin (Nat.); 2918 Manchester (Nat.)

[See Advertisement on back of Wrapper.

Messrs. HUMPHREYS & GLASGOW

CARBURETTED-WATER-GAS PLANT

— DOUBLE-SUPERHEATER SYSTEM. —

	Cubic Feet Daily.		Cubic Feet Daily.		Cubic Feet Daily.
Copenhagen	700,000	Holyoke, Mass	600,000	Maidenhead	225,000
Copenhagen (Second)	2,500,000	St. Joseph, Mo.	750,000	Epsom	225,000
Belfast	1,700,000	Lea Bridge	350,000	North Middlesex	150,000
Belfast (Second)	4,500,000	Lea Bridge (Second)	350,000	Wandsworth & Putney	1,800,000
Brussels—Ville	750,000	Stockton-on-Tees	500,000	Aarhus	800,000
Brussels—Ville (Second)	750,000	Edinburgh	2,000,000	Falmouth	150,000
Liverpool	3,500,000	Guildford	350,000	Southampton	800,000
Liverpool (Second)	4,500,000	Brentford	1,200,000	Hartlepool	750,000
Tottenham	750,000	Syracuse, N.Y.	850,000	Utrecht	1,000,000
Tottenham (Second)	750,000	Bridlington	150,000	Deventer	150,000
Santiago de Cuba	400,000	Middlesbrough	1,250,000	Portsmouth	1,000,000
Swansea	750,000	Croydon	1,250,000	Bournemouth	1,000,000
Manchester	3,500,000	L. & N.W. Rly., Crewe	700,000	Aylesbury	150,000
Brighton	1,750,000	Taunton	225,000	Hamburg	1,750,000
Preston	1,400,000	Lawrence, Mass.	400,000	Redhill	275,000
New York	1,200,000	Commercial Gas Co.	850,000	Dublin	2,000,000
Southport	750,000	Commercial (Second)	850,000	Posen	450,000
Bath	1,000,000	Commercial (Third)	1,250,000	Dunedin, N.Z.	150,000
Newburgh, N.Y.	350,000	Rotterdam	850,000	Lincoln	500,000
Newburgh (Second)	250,000	Dorking	150,000	Brighton (Second)	1,850,000
Hoylake	125,000	McKeesport, Pa.	500,000	Stockport (Second)	600,000
Coventry	600,000	G. L. & C. Co., Bromley	3,750,000	Croydon (Second)	625,000
Coventry (Second)	600,000	G. L. & C. Co., Nine Elms	2,750,000	Maidenhead (Second)	225,000
Bordentown, N.J.	125,000	Durham	200,000	G. L. & C. Co., Beckton	2,250,000
Winchester	225,000	New York	4,000,000	G. L. & C. Co., Fulham	1,750,000
Shanghai	225,000	Scarborough	800,000	Watford	300,000
Stockport	600,000	Perth, W.A.	125,000	Eastbourne	1,250,000
Norwich	1,000,000	Bremen	550,000		

Since Jan. 1st 1900.

Antwerp	1,500,000	Waltham	400,000	Sydney—Harbour (Second)	500,000
Brussels—Forest	1,000,000	Geneva	500,000	Sydney—Mortlake (Second)	500,000
Tottenham (Third)	350,000	The Hague	1,000,000	Watford (Second)	350,000
Sydney (Harbour)	500,000	Romford	300,000	Southport (Second)	900,000
Sydney (Mortlake)	500,000	Göteborg	300,000	**FOR THIS YEAR'S CONSTRUCTION.**	
Manchester (Second)	3,500,000	Carlisle	600,000	Dunedin (Second)	275,000
Longton	600,000	Redhill (Second)	300,000	Taunton (Second)	350,000
Hull	1,500,000	Heidelberg	200,000	Bognor	100,000
St. Gallen	225,000	Rotterdam (Second)	1,500,000	Bournemouth (Second)	500,000
Colney Hatch	400,000	North Middlesex (Second)	200,000	Vienna	3,500,000
Dublin (Second)	2,000,000	Rotterdam (Third)	750,000	Maastricht	200,000
Birmingham	1,500,000	Merthyr Tydfil	300,000	Antwerp (Second)	1,000,000
Tunbridge Wells	1,000,000	Shanghai (Second)	225,000	Tottenham (Fifth)	1,000,000
Faversham	200,000	Magdeburg	1,400,000	The Hague (Second)	500,000
Staines	600,000	Posen (Second)	700,000	Hampton Court	500,000
Commercial (Fourth)	2,000,000	Barrow	300,000	Lea Bridge (Third)	400,000
Southampton (Second)	500,000	Reichenberg	200,000	Dublin (Third)	650,000
Liége	1,000,000	West Ham	1,500,000	North Middlesex (Third)	75,000
Hebden Bridge	200,000	Deventer (Second)	200,000	St. Gallen (Second)	225,000
Chorley	300,000	Bremen (Second)	950,000	St. Josse, Brussels	1,000,000
Stafford	500,000	Malta	400,000	Dundee	1,500,000
Bridlington (Second)	200,000	Croydon (Third)	625,000	Bridgwater	200,000
Beckton (Second)	10,750,000	Tilburg	400,000	West Ham (Second)	800,000
Tottenham (Fourth)	1,000,000	Ostend	100,000	Brieg, Silesia	100,000
Gosport	200,000	Zwolle	200,000	Brussels—Ville (Fourth)	350,000
Brussels—Ville (Third)	1,500,000	Utrecht (Second)	1,000,000	Innsbruck, Austria	200,000
Swansea (Second)	1,000,000	Port Elizabeth	400,000	Marlborough	100,000

H. & G. TOTAL OF ABOVE CAPACITIES **150,200,000** CUBIC FEET DAILY.
UNITED GAS IMPROVEMENT CO., U.S.A. **426,800,000** CUBIC FEET DAILY.

TOTAL 577,000,000 CUBIC FEET DAILY.

38, VICTORIA STREET, LONDON, S.W.
Telegrams: "EPISTOLARY LONDON."

UNITED STATES OFFICE:
31, NASSAU STREET, NEW YORK.

CONTENTS.

EDITORIAL NOTES.

GAS, &c.—
Alteration of the Gas Supply of the Crystal Palace District 89
The Gas Referees and the Departmental Committee's Report. 89
The Report of the Chief Inspector under the Alkali Acts 90
A County Surveyor's Ideal Depth for Gas-Pipes 91
The Vertical Retorts at Berlin—Competitive Prizes of the Société Technique du Gaz—A Hint for Gas-Stove Makers—Dear Money and Municipal Needs—Gas Affairs at Manchester—Voting Powers for Companies—An Objection—The Proposed Private Bill Legislation for Wales—A Prompt Defence of Gas at Newport (I.W.) 91
WATER AFFAIRS—
Papers at the Water Engineers Conference 93

ESSAYS AND REVIEWS.

An Appeal by the Crystal Palace District Gas Company to the Consumers 94
The Report of the Chief Inspector under the Alkali Acts 96
Gas and Water Stock Market 97
Electric Lighting Memoranda 97
The Gas Congress at St. Louis 98
With the Water Engineers in Belgium and France 98
The New Gas-Works at Nanterre 100
Another Air-Gas System 105

PARLIAMENTARY INTELLIGENCE.

Progress of Bills 118
Gleanings from the Committee Rooms . . 118
London Gas Companies and the Supply of Electricity Bill 119

TECHNICAL RECORD.

Analyses of Ammoniacal Liquors 105
Meeting of the Belgian Gas Engineers . . 106
The Luchaire-Lecomte Pressure Regulator . 107
Light Measurement 108
Studies on the Claus Reaction 112
British Association of Water-Works Engineers—Annual Meeting at Hull—
Dr. Thresh on Pure and Polluted Water . 115

CORRESPONDENCE.

Mixing Breeze with Coal at the Nanterre Gas-Works 117
Mr. H. E. Jones and the Nanterre Gas-Works 117
Coal and Water Gas from Vertical Retorts . 117
The Arrangement of Grids in Oxide Purifiers 118
Flow of Gas in Mains and Distribution at High Pressure 118

LEGAL INTELLIGENCE.

Supreme Court of Judicature—Court of Appeal—South-West Suburban Water Company *v.* Marylebone Guardians 120
Dublin Police Court—Question as to the Depth of Laying Gas-Mains 120
Prepayment Meter Damaged by a Thief . . 121

MISCELLANEOUS NEWS.

Committee on Metropolitan Gas Testing . . 121
The Past Year's Work at Manchester. . . 127
Goole Gas and Water Supply—Satisfactory Year's Working; Reduction in the Price of Gas 127
Hindley Gas and Water Supply—The Past Year's Working 127
The Municipal Trading Question in Edinburgh—Memorandum by Mr. W. R. Herring 127
Electric Lighting in the Isle of Wight. . . 129
Metropolitan Water Board—Issue of Water Stock; Transfer of the Undertakings . . 130

MISCELLANEOUS NEWS (*continued*)—

Lambeth Water-Works Company 130
Teignmouth Water Supply—Agreement with Paignton 131
Plymouth Corporation Water Supply . . . 132
Standardization of Water Fittings 132
Notes from Scotland 133
Current Sales of Gas Products 135
Coal Trade Reports 136
Patent Notices 140
Stock and Share List 140

PARAGRAPHS.

Personal 97
The Audit of Municipal Accounts 107
International Gas Exhibition, Earl's Court—Darlington Gas Supply 119
Sale of Shares—Maintenance of Incandescent Burners at Kilkenny—Introduction of Slot Cookers at Southport—New Issues of Gas and Water Stocks—Trouble with Gas-Irons 136
Norwich Water Company—Gas and Electricity at Stockton Heath—Gas-Fire Rents at Stafford—Reductions in Price—Turin Gas Company—The New Water-Works at Honiton—Maintenance of Burners and Gas-Stoves in Scotland—Water-Gas Plant for Rochdale 137
Llanelly Public Lighting Question—Gas Profits at Workington—Stockport Corporation Gas Supply—Colchester Water Supply—Fatal Gas Explosion at Sunderland—The Omagh Award—Morecambe Corporation Gas Supply 138
A Comparison that is Odious to Electricians—Inverted Gas Lighting at the Italian Exhibition—Painful Sequel to the Trouble at West Bromwich—Electric Lighting Charges at Rathmines—Misleading Electricity Meters 139

HENRY BALFOUR & CO.

LIMITED,

LEVEN, FIFESHIRE.

Contractors for the Supply and Erection of all Classes of

Gas-Works Plant.

THE "ANNULAR" BRUSH WASHER-SCRUBBER

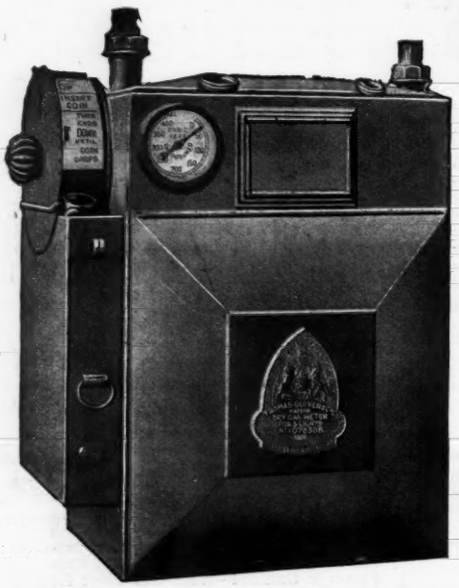
(CREEKE'S PATENT).

Made with Cast-Iron or Mild Steel Cylinders.

PRICES AND PARTICULARS ON APPLICATION.

London Representative: MR. HENRY PUPLETT, 47, VICTORIA STREET, S.W.

THOMAS GLOVER & CO.'S



PATENT NEW IMPROVED PREPAYMENT METER

For Pennies, Shillings, or any Coin.

Simple in Mechanism.
Positive in Results.
Price Changer *in Situ.*

GUARANTEED FOR FIVE YEARS.

Telegraphic Address: "GOTHIC, LONDON." **Telephone No. 6159 Bank.**

THOMAS GLOVER & CO., LTD.,

GAS-METER MANUFACTURERS,

LATE OF CLERKENWELL, NOW 49, QUEEN VICTORIA STREET.

Telegraphic Address: "GOTHIC, LONDON." **Telephone No. 6159 Bank.**

BRISTOL:	BIRMINGHAM:	MANCHESTER:	GLASGOW:	BELFAST:	MELBOURNE:
28, BATH STREET. *Telegraphic Address:* "GOTHIC." Telephone No. 1005.	57 & 58, BROAD STREET. *Telegraphic Address:* "GOTHIC"	132 & 134, CORN EXCHANGE BUILDINGS. *Telegraphic Address:* "GOTHIC." Telephone No. 3898.	26, WEST NILE STREET. *Telegraphic Address:* "GASMAIN." Telephone No. 6107 Royal.	8, EXCHANGE PLACE, DONEGALL STREET. *Telegraphic Address:* "GOTHIC."	23, WRIGHT'S LANE, LONSDALE STREET. Telephone No. 3716.

PARKINSON'S

PATENT

EQUILIBRIUM GOVERNORS.

These Governors are being used at a great many Works, and all Engineers speak of them in words of unqualified praise.

FITTED WITH SIX COLUMNS and GIRDERS, WEIGHTS or WATER PRESSURE.

PARKINSON AND W. & B. COWAN, LTD.,
(*Parkinson Branch*),

COTTAGE LANE, CITY ROAD, LONDON.	BELL BARN ROAD, BIRMINGHAM.

JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. LXXXVII., No. 2148.—TUESDAY, JULY 12, 1904.

EDITORIAL NOTES—GAS, &c.

Alteration of the Gas Supply of the Crystal Palace District.

As will be seen by particulars given elsewhere, it is not Sir George Livesey's intention to permit unnecessary delay to intervene before the public receive the benefit of that deliverance from the nuisance of one branch of the operation of gas manufacture which has been so long overdue. This interesting incident of contemporary gas politics suggests many reflections. Foremost of these thoughts, which are likely to occur to all gas engineers, is that, after all, gas companies have a duty to the public which may be other than anything which local governing authorities can take cognizance of. The question of the extent to which a local authority is identical with the people of its district is a curious one, which is likely to be pressed more and more as time goes on. It was raised in connection with some of the proceedings of the Local Authority for Rickmansworth, who, in a recorded instance, assumed to represent the inhabitants of that district, and had to be put in their proper place by one of His Majesty's Judges. The mistake is a natural one. Local government bodies throughout the United Kingdom have so many duties, and exert so much power, that everybody is surprised when they are brought up "all standing" against one of their constitutional or legal limitations. There is no department of the life of a community in respect to which these limitations of the powers of public authorities are so near at hand as in regard to the law of nuisance. People who are, or think themselves, offended by the existence of any kind of nuisance which affects their enjoyment of life at home or abroad, are prone to call in the first place upon their representative local government, whatsoever its form, for help. A familiar illustration of this tendency, as manifested by the lowest orders of the populace, appears in their habit of appealing for assistance to the police, or a Magistrate. The lesson that there are yet many afflictions of police-protected, and municipally-governed humanity from which the sufferer must deliver himself, if he is to be delivered at all, is one that needs to be constantly re-given.

Closely connected with the philosophy of the foregoing observation, is the phenomenon of official interference between man and man to no useful effect, which is one of the almost unavoidable consequences of the extension of government. Speaking, now, only of municipal government, this interference of the authority in the affairs of the citizen has already attained an enormous and portentous development, and is still growing. Every parliamentary session sees more of it. That *imperium in imperio*, the Police and Sanitary Regulations Committee of the House of Commons, grows busier and more busy every year. Originally appointed to reduce to something like order and uniformity the independent aspirations after improved conditions of town life of discrete local authorities, this Committee has found its work growing upon its hands, and the task of regulation merging in the more exacting duty of adding to urban laws. A few prophets of the older dispensation, when man was more a law unto himself than he is now permitted to be, in most places, raise the voice of protest and deprecation against this progressive invasion of the liberty of the subject to behave himself as he likes. They are as those who cry in the wilderness. Everywhere, the King's lieges are being directed by an increasing number of municipal rules and regulations as to what they are to do, or not do, as the case may be, on pain of fines of 40s. and upwards. One can hardly see the grass of municipal recreation grounds for the notice boards which warn the wayfarer off it. The same thing is going on all round us, with the inevitable result of reducing the people to the state of being municipally dry-nursed, and thereby deprived of individual enterprise and initiative. There is not half the pleasure in being even a Passive Resister, or a Conscientious Objector, when proper forms for doing it regularly must be first obtained at the Town Hall.

The Crystal Palace District Gas Company have suffered grievously from the almost accidental circumstance that the London County Council have a footing in an outlying part of their area. This fact has permitted the County Council to pose as dictators to the Company, in the name of the sovereign people. The Council are not in the business of gas manufacturers, and know nothing whatsoever of the wants and desires of the people for whose service the undertaking is carried on. Yet, by reason of their statutory position on the Company's flank, and in accordance with their assumed task of setting everybody right, this public authority have afflicted, and will continue to afflict, the Company as they think fit, at the expense of the ratepayers of London. Really, this is Municipalism run mad. "Progress," they call it. Many people are concerned, and rightly so, over the unnatural trading propensities of local authorities, which, while pretending to benefit the ratepayer, really pick his pocket. There is, however, an almost greater evil in the land than Municipal Trading; and that is, municipal tyranny over traders and their customers alike. The very fact of their being out of the business themselves, is presumed to be sufficient qualification for the interference of these bodies with the course of the trade. They think they know better than the tradesmen what the customers of the latter require; and Parliament apparently sees no absurdity in the claim, nor extravagance in its assertion.

The friends of Liberty in all ages have had to be upon their guard against the machinations of its foes. Eternal vigilance, as the proverbial saying reminds us, is the price of this boon. The trouble ever is to detect the enemy of Liberty in the pretended friend of Humanity. Democratic forms of government can be as tyrannical as the most despotic, with the additional disadvantage that there is no ready means of deliverance from their oppressions. The continued encroachments of British municipal authorities on the domain of private enterprise, whether in exploitation or control, are all the more dangerous for their insidious and plausible character. Probably they do not know the mischief they do, when they set up authority against the developments of private interest that they may not at first be able to understand. This is mere mandarinism, of which the London County Council have proved unfailing exponents in all matters relating to the Metropolitan Gas Supply.

The Gas Referees and the Report of the Departmental Committee.

THE report of the Board of Trade Committee has been discussed pretty freely up and down; and has been commended upon some points and condemned on others. Against the commendation, no one has raised pen or voice; and where there has been condemnation, no one has come forward from within the ranks of the gas industry to show that it is not deserved. Something may come from Spring Gardens; but the quality of the gas produce from that quarter has not sufficiently commanded the esteem of the industry or of Parliament for it to now have much weight or influence. But here is the report. The question now is, what next? Who is going to make the move that will cause the report to be effective? Take, for illustration, just one point only. Who is going to give the Companies relief from lime purification? On the first blush, it appeared as though the Companies would, by some means, obtain immediate alleviation. The Committee recommended: "That the obligation placed upon the Companies with regard to the removal "of the sulphur impurities (other than sulphuretted hydrogen) "should be abolished, but that testing for information only "should continue to be made in such manner and to such "extent as may be prescribed by the Gas Referees." But on reading this recommendation in conjunction with clause 19 of the report, it is obvious that nothing can be done except by legislation, and legislation alone. There it will be seen that, speaking of the relaxation of the requirements with respect to sulphur purification, the Committee declare

that they do not think that the pecuniary advantage is, in itself, sufficient to justify them in recommending any consequential reduction in the standard price of gas. But they go on to suggest that the removal of these onerous regulations would furnish an appropriate occasion for revising the present arrangements of the sliding-scale, and substituting for them arrangements in which the standard price and the rate of the variation of dividend would be fixed so as to give the Gas Companies greater incentives to economy, while being equally favourable to the public under normal conditions. These suggested terms in clause 19 are in one respect unfortunate, because their effect is to delay the possibility of carrying out, with authority, this particular recommendation.

The plenipotence of the Gas Referees in regard to sulphur purification was not only inflictive but relaxative, and they could, had they so desired, have done much to relieve the Companies. The suggestions of the Committee, however, rather cripple their jurisdiction for the time being. They, anyway, have been interviewed on the matter by two of the London Gas Companies. It need hardly be said that in this interview the South Metropolitan Gas Company had no part; for, since the last appointment, the Company have held that the Referees are an illegally constituted body, and, participating in the interview, would have constituted a recognition that Sir George Livesey and his co-Directors are not likely to make. However, at the interview were Mr. H. E. Jones, representing the Commercial Gas Company, and Mr. G. C. Trewby, the Gaslight and Coke Company, The Referees asserted their inability to do anything in the way of acting upon the recommendation of the Departmental Committee, in view of the suggestions forming part of clause 19. This settles the matter as far as the Referees are concerned. But somebody has to make the move. Possibly the County Council will do it; and, if they do, they may be relied upon to strain every sentence of the report to the utmost extent. If they do not, then the duty of making a start in the matter will devolve on a Gas Company; and it looks very much as though—failing the County Council—it will be the Commercial Gas Company who, as Mr. Jones would facetiously put it, will have to "bell the cat." It will be remembered that the provisions of the Company's last Act were only permitted a sufficient active life to enable the Departmental Committee to inquire and report. So that the Commercial Company will, in all probability, be the first of the three London Gas Companies to approach Parliament under the fresh conditions created by the report.

One point more, the proposal of the Committee that the relaxation of the requirements with respect to sulphur purification should be made the occasion for revising the sliding-scale arrangements, is practically an endorsement of the suggestion of Sir James Rankin's Committee, that the initial price and the increment of dividend should be so revised as to serve as greater incentives to the Gas Companies to reduce their charges for gas. It stands to the credit of Mr. Haward, of the London County Council, that he has demonstrated that, by cutting down the initial price too low, it puts the realization of further dividend so far off as to cause the sliding-scale to supply no real inducement to reductions. But what Sir James Rankin's Committee proposed, and what the Departmental Committee suggest, is that the Companies shall be given some compensation for the reduction of the initial price, and that the compensation shall be sufficient to give them a greater interest in making reductions of price to the consumers. This can easily be accomplished by lowering the initial price and increasing the rate per cent. of increments of dividend for reductions of the price of gas. Take the South Metropolitan Gas Company as an example. The initial price is 3s. 1d.; and every reduction of a 1d. entitles the proprietors to an increase of 2s. 8d. per cent. in their dividend. The present price to the consumers is 2s. 1d. Suppose the initial price was reduced to 2s. 9d., and the rate of increase of dividend to 4s. per cent. for penny reductions, the proprietors would, under these circumstances, get exactly the same dividend at the present price of gas (2s. 1d.) as under existing conditions—2s. 8d. multiplied by 12 amounts to £1 12s.; 4s. multiplied by 8 comes to the same figure. Then below the present price—or 2s. and less—the proprietors would, under the new arrangement, get a larger dividend than at the existing rate of increase and a higher initial price. There is one other noticeable thing in that section 19 of the Departmental Committee's report. It is this, that "in revising the [sliding-scale] arrangements it "would be well to bear in mind that the larger proportion of "gas consumed is even now used for purposes for which the "calorific value is the important point." Associating this with the revision of the sliding-scale can surely have only this one meaning—that the Committee are of opinion that what is required nowadays is a cheaper gas for heating purposes; and one way to get this is to give the Companies "greater incentives to economy." It will thus be seen that, in addition to purification and testing matters, the revision of the sliding-scale arrangements takes an important place among the Committee's proposals, though not directly involved in their formal recommendations.

The Report of the Chief Inspector Under the Alkali Acts.

To the superficial observer, there is not a very close connection between works employed for the production of alkali and those in which the manufacture of gas is carried on; and the conclusion might be justified that there could not be much to interest a gas maker in the reports annually presented to the Local Government Board and the Secretary for Scotland on the work done in the direction of preventing the first-named works from being productive of nuisance. Readers of the "JOURNAL," however, are not of the class referred to; and they know that about this season a large portion of our space has for some years been occupied with extracts from these reports, for the reason that the titles of the Acts under which they are made contain an "&c." which embraces works wherein ammoniacal liquor is treated and the distillation of tar carried on, and that consequently they come under inspection. They also know that the work of the Chief Inspector (Mr. R. Forbes Carpenter) and his group of Sub-Inspectors is not confined to scrutinizing the processes incidental to the above-mentioned operations, with the view of penalizing transgressors against the regulations of the Acts, but is extended to investigations into processes which have an important bearing upon the present and future of the gas industry. Evidence of this has been furnished in the reports presented by Mr. Carpenter ever since he succeeded to the position he now occupies, and notably in that published last week—the fortieth of the series—a general notice of which, as well as other matters connected with it, will be found elsewhere in the present issue of the "JOURNAL." In the latter portion of Mr. Carpenter's report to the Secretary for Scotland for the year 1902, he began the consideration of the reaction going on in the Claus kiln, and gave the results obtained in the new works constructed by Mr. Herring at Granton for the Edinburgh and Leith Gas Commissioners. Recognizing the value of these investigations, facilities were afforded by the Newcastle and Gateshead Gas Company, by Sir George Livesey, and by Mr. Alfred Colson for carrying them on in their respective works; and they were conducted by Mr. Carpenter's Assistant (Mr. S. E. Linder, B.Sc.) and two District Inspectors (Messrs. Sutton and Young), whose help their Chief gratefully recognizes. It is impossible to do more here than direct attention to these elaborate investigations.

With regard to other matters upon which information is furnished by the Chief Inspector, it is satisfactory to find that, though 4838 visits were paid to works last year, and 5211 tests were made, in only one case—and it was not of a gas maker—was it necessary to take proceedings for the recovery of a penalty for an infraction of the provisions of the Act of 1881. Mr. Carpenter records with much gratification the continued increase in the sulphate and muriate of ammonia and gas liquor works; there being now a greater tendency than formerly for the residual products of gas manufacture to be worked up instead of being disposed of to a contractor. It will be seen from the figures given elsewhere that there was a slight falling off in the production of sulphate of ammonia from gas-works during the past year, compared with 1902; but the iron, shale, and coke-oven works yielded more. A conspicuous increase is noticeable from producer gas and carbonizing works—being 10,265 tons, against 8177 tons and 5891 tons in the two preceding years. The drop of the yield from gas-works is explained to be due to a considerable decrease in Scotland, where upwards of 1500 tons less sulphate was produced.

Before leaving the report, it may be mentioned that a Bill is now before Parliament to amend the two Acts which at present govern alkali and other works. A similar

Bill was introduced last session, not, as was stated at the time, with a view to its passing, but in order that the parties concerned might have an opportunity of considering its provisions during the recess. The Chief Inspector has had conferences with representatives of the various industries affected, with the result that agreed amendments have been embodied in the Bill, the main objects of which are to re-establish more securely the power of control over sulphuric acid works, to define more closely the obligations of "the best practicable means," and also the words "noxious "and offensive gases." The Bill has not yet been read a second time (it is down for to-day); and there is but little likelihood that it will make much progress this session in view of the condition of business.

A County Surveyor's Ideal Depth for Gas-Pipes.

As our legal reports have recently shown, the Dublin County Council have been renewing their attempt to interfere with the discretion of the Alliance and Dublin Consumers' Gas Company in the matter of the depth at which their gas-pipes should be laid. The County Surveyor (Mr. W. Collen) has set up for himself an ideal depth for gas-pipes, and that ideal—3 feet—he worships obstinately and with an utter disregard of all practice, experience, opinion, and the physical requirements of gas distribution, to say nothing of the extravagant cost of complying with it, and with the extra elaborate conditions which he wishes to impose upon the Company. Looking over the mass of litigation for which Mr. Collen has been responsible in connection with this matter of depth, one leaves it wondering whether any more will be necessary before he—the adviser of the County Council—is convinced that his ideal is an impossible and useless creation. The pity of it is that his unyielding adherence to immoderation has already run the County Council and the Gas Company into a pretty heavy bill of costs.

Right away from 1899, the question has been in dispute between the Dublin County Council (or perhaps we should say Mr. Collen) and the Company; and in the following year both in the Rolls Court and the Court of Appeal the Company succeeded. They then obtained an injunction against the employment of a steam-roller in such manner as to inflict injury on pipes which, before such road-making appliances came into use, were sufficiently and properly laid; but in the Court of Appeal, it was determined that "in "the future, and also with respect to pipes laid since the "introduction of steam-rollers, the Company must lay their "pipes at such a depth, and in such a manner, as not to be "liable to injury from the use by the defendants of what is now "a reasonable means of repairing the road." Last year Mr. Collen broke out again when the Company were proposing to lay a main at 2 ft. 5 in. under the level of the roadway in Stillorgan Park, and claimed his full 3 feet. The Magistrate sitting at the Kingstown Police Court (Mr. Drury) was called upon to decide what was the depth at which the main should be laid; and he pronounced the 2 ft. 5 in. to be sufficient. The last essay at obtaining a recognition of the 3 feet ideal has been made by Mr. Collen over a short length of pipes connecting up to other sections laid 2 feet below the surface, to which depth the Company were proposing to (and will now) lay the pipes in question. The matter came before the same Magistrate (Mr. Drury), sitting in another Court; and the case has occupied three days, and in one particular is still unfinished.

On the principal point, the Magistrate had not had much difficulty in arriving at a verdict. He could not reverse the decision of the Master of the Rolls and his own judgment in the Kingstown case, nor could he accept the vituperation of Counsel and the evidence of Mr. Collen and Mr. H. T. Harris (a supplier of steam-rollers) as the counterpoise of the evidence of personal and general practice which was laid before him by Mr. Charles Hunt, Mr. W. R. Herring, the Company's officials, and Mr. Spencer Harty, the City Engineer—all of whom have found a 2 feet depth for gas-pipes quite adequate to present-day road treatment and use. The Magistrate was convinced by this testimony; but he attached to his order the words "and so that no service-pipe approach-"ing from the said main shall be at a less depth than 2 feet." This is an impracticable condition. The Company's legal representative took exception to it; and the point has been left open for further discussion. Now, surely, Mr. Collen must agree that his "ideal" has about it the imperfection of unreasonableness.

The Vertical Retorts at Berlin.

The trial installation of vertical retorts which the Imperial Continental Gas Association have made (in conjunction with the owners of the patents) at their Mariendorf works at Berlin, is now in operation. Naturally, since its erection, many improvements have been made; and those who are responsible very wisely prefer to go slowly. Until there has been a long period of working, it has been decided that none of the results shall be published; but, during the recent meeting of the German Association at Hanover, it was freely stated that the results are of a satisfactory character. In the report to hand of the proceedings at the annual meeting of the Belgian Gas Association (published elsewhere), it will be remarked that, on this occasion, Mr. H. H. Salomons, the Engineer of the Brussels works of the Imperial Continental Gas Association, made, at the request of the President, a statement on the subject—he having been, with other Imperial Continental Engineers, to Berlin to inspect the vertical retort-bench. He declined to go into details; but he fully endorsed the statement that the results obtained up to the present are very satisfactory, and give every hope of success. His further observations show that the period of carbonization is a somewhat extended one, and they suggest that the charges are large. "As is to be expected," he said, "the gas produced, after eight or nine hours' distillation, is somewhat inferior;" but, on the other hand, the coke is of a superior quality. This latter has also been the experience with another vertical system.

Competitive Prizes of the Société Technique du Gaz.

The French Gas Society certainly loses no time after its annual meeting in notifying members of the several prizes that are open for competition during the year 1904-5. Under date of July 4, and above the name of the President, M. Visinet, such notices have just been issued. The prizes offered are practically the same as usual; but they may just be briefly summarized. A sum of 10,000 frs., or £400, will be given (in whole or in part), as customary, to persons effecting marked progress in apparatus for the manufacture or utilization of gas, for lighting, motive power, &c. A similar award is offered for a new incandescent gas-burner for working under ordinary conditions, and showing noticeable improvements over any existing burners. Then for advancements made in systems of automatic lighting, a sum of 5000 frs., or £200, is offered (in whole or in part). Models and drawings of such apparatus should be sent to the Société Technique before Feb. 1, 1905. The same amount will also be given, under similar conditions, for improved gas stoves and cookers. Also £200 is the prize for those achieving notable progress with apparatus for using coke—included in which are producers intended for the production of poor gas or water gas. The usual prize up to 5000 frs. is again offered for artistic gas-fittings; and for the best treatises on any subject interesting the gas industry, a sum of 8000 frs. (£320) is available for distribution. Manuscripts of these treatises must be sent in before March 1, 1905, and the instructions of the Society adhered to. It is perhaps not generally known that all the above prizes are open to any person, whether French or not, and whether a member of the Société Technique or not. The prizes constitute in fact, a world-wide competition for the gas industry.

A Hint for Gas-Stove Makers.

The Canadian Commercial Agent at Melbourne has made a report on modern heating appliances in Victoria, where, according to him, things are in a bad way in this particular line. A large number of halls, churches, &c., throughout the State, it seems, are absolutely without heating arrangements; and complaints appear, from time to time, in the Press concerning the cold experienced in such buildings. The Agent referred to thinks it is probable that a demand will shortly arise for hot-water and steam-radiators, and warm-air furnaces. Last winter the two principal theatres in Melbourne were heated for the first time —one on the radiator principle, and the other by electricity; but it is not astonishing to hear that the latter was not "very successful." And it is said by the Canadian Agent that these are the only instances in which an attempt has been made to heat places of amusement in Victoria. But what about gas-fires. If we are to believe this gentleman, they are scarce in Victoria—or rather

in hotels and office buildings; and what there are are of an indifferent and objectionable type. We have little direct information about these matters as they relate to Australia; and it will be understood that, if there are any respectable firms of gas-fire makers doing a good business in Victoria, the statements contained here have their origin in the report referred to. We are, however, afraid that, so far as gas-fires are concerned, the truth rests with the report. The price of gas in Victoria is not at the low figure that can make the gas-fire very attractive as an economical method of heating. But a little more inquiry might with advantage be made into the matter. The Victorian winter extends from about May until the end of September; so that there appears on this report to be an opening for an energetic firm to make an effort to place their manufactures on the market there, and to educate the people in the use of modern heating appliances. It is advised by the Canadian Agent that, to successfully introduce these appliances, would require the services of an expert in the business, fully qualified to sell the goods, and attend to the installation. The suggestion may be worth acting upon by those engaged in the manufacture of gas-heaters.

Dear Money and Municipal Needs.

"Who goes a-borrowing goes a-sorrowing." The old proverb is particularly true in these times in its application to municipal councils. The palmy days of loans at $2\frac{3}{4}$ and 3 per cent. are gone, and municipal schemes which wore so fascinating and hopeful a look when money was cheap, are much less attractive now that 4 per cent. has come to be recognized as a minimum for new issues of this class. In the exchange of confidences at the recent meeting of the Institute of Municipal Treasurers and Accountants, the gloomy fact had to be faced that corporation stock is now a drug in the market, and that it is impossible to raise money for municipal trading except at rates of interest which, in comparison with former experiences, seem absolutely ruinous. In these circumstances, corporations are not unnaturally doing their best to keep away from the Money Market. A good many municipal schemes have been "hung up" to await the dawn of a brighter day; and several expedients of a make-shift kind are resorted to in order that money may be provided for the work which cannot be put off. An overdraft at the bank is illegal in the case of corporations; but it seems that it is a common thing to find them owing their bankers sums ranging from £50,000 up to £300,000. There is also a general resort now to the system of short loans, which presumably supply immediate needs, though this kind of accommodation is dear, and is open to the objection that the lender may call in his money when it is inconvenient to repay it. It is, however, a sign of the times not without significance to find municipalities relying again upon investors of small sums, instead of making, as in recent years, large issues of stock. So far as dear money tends to check some of the wilder schemes of municipal trading, it is matter for congratulation. Unfortunately, the ratepayers do not gain much either way. If some schemes are put off to a more convenient season, others cannot be postponed; so that, in one way or another, debt continues to accumulate, and the demands of the ratepayer, like those of the tax gatherer, become always more and more.

Gas Affairs at Manchester.

Highly satisfactory reading is the report of the Manchester Corporation Gas Committee on the working of the department during the past financial year. The reduction of 3d. per 1000 cubic feet, which took effect over nine out of the twelve months, together with the abolition of stove hire, cost £46,000; but already £16,000 of this (or about one-third) has been recouped by additional consumption and improved working results. This means, of course, that there was an increased output of gas last year; and we learn from the report that the expansion amounted to 3·25 per cent., which compares with a very trifling decrease (0·69 per cent.) in the previous year, and an increase of nearly 3 per cent. for the twelve months before that. What such an increase as has just been realized means, can be better understood by reference to the details in the report, which show that the output of gas was larger last year by over 157 million cubic feet than in 1902-3. Though the total increase in consumption last year amounted, as already mentioned, to 3·25 per cent., it is interesting to note that 10·58 per cent. more gas was sold to the prepayment meter consumers, 8·53 per cent. more was used by cookers and fires, and 10·95 per cent. more was employed to run engines. The result of the working, in short, was a gross profit of £183,685, and a net profit (after allowing for interest and sinking fund) of £93,841. For the previous year, the figures were £222,482 and £133,478 respectively. Of the available profit, £70,000 has been paid into the city fund (the contribution usually fixed upon is £50,000, but this was on the last occasion added to under special circumstances), and about £22,000 was placed to the contingent account. A further reduction of 2d. per 1000 cubic feet to ordinary consumers took effect from the 24th ult.; but after allowing for this, the net profit for the twelve months ending March next is estimated at £46,639, which will be much more than absorbed by the contemplated contribution of £60,000 to the city fund—the additional amount required being arranged to be taken from the contingent and building funds. So long as the Committee find themselves in a position to offer reductions in price to the consumers, there will probably be no widespread objection to this large grant in relief of the burdens that should be borne by the general body of ratepayers; but should the financial aspect unfortunately take a change for the worse, we may expect to see a considerable amount of attention devoted to the subject. The principle is one that, as the "JOURNAL" columns have shown, has lately been brought into question in various parts of the country, and the opposition to which appears to be steadily growing.

Voting Powers for Companies.

At the meeting of the Manchester City Council last week, attention was drawn by Alderman Southern (when moving the confirmation of the proceedings of the Parliamentary Committee) to what he described as the injustice to limited liability companies in being debarred from exercising the franchise; and he asked the Council formally to express approval of the Bill now before Parliament, by which it is proposed to give a vote to the chosen representative of a company, for municipal purposes only. In order to show the anomaly of the existing state of the law, he took the case of one particular street in Manchester, in which there are 182 assessments. Of these, 52 are of property owned by limited companies, the total amount being £24,846; while the assessment of the remaining 130 places is £23,056. In the case of the former, the owners have, of course, no voice in the election of municipal representatives; and this, in Alderman Southern's opinion (as in ours), is not just, "for taxation without representation is tyranny." The matter has long been a great grievance, not only to limited liability companies, but to others also; and it will be remembered that only a few weeks ago reference was made in these columns to the fact that the bills of the Gaslight and Coke Company now bear the intimation that "the price charged for gas includes an amount of $2\frac{1}{2}$d. per 1000 cubic feet, paid by the Company in the shape of rates to the Local Authorities, over whose expenditure the Directors have no control." With the perpetually rising rates and the bewildering variety of the businesses in which municipalities are embarking, the need for ending the present state of affairs gets more pressing every day; and it is therefore gratifying to see that the Manchester City Council did the little that in them lay by passing the resolution asked for by Alderman Southern.

An Objection.

This, however, was not done without a protest by one of the members, who said that as a rule limited companies were concerned mainly with keeping down the rates, and in many cases the shareholders had no interest in the city beyond making money. Another gentleman pointed out that very many of the companies were controlled by excellent business men, who were competent to do good service as members of the Corporation, but who were debarred by the law as it stands from entering the Council. To this, it was replied that an easy way out of the difficulty would be for the heads of companies to rent a room in their business houses. But Alderman Southern said this would be a subterfuge, and the Council had already been deprived of the services of one good man because he would not, when challenged, go before the Revising Barrister and sustain a vote obtained in this way. If the arguments here noted are the best that can be adduced in opposition to the Bill, we ought very soon to see an

alteration in the law on the subject. Companies should not be compelled to remain under the existing disability simply because they are "concerned mainly with keeping down the rates." The over-burdened taxpayer might well be pardoned if he regarded this more as an advantage than otherwise.

The Proposed Private Bill Legislation for Wales.

It may be remembered that towards the end of April a Select Committee was appointed to consider the Private Bill Procedure (Wales) Bill introduced by Mr. M. Vaughan-Davies, the member for Cardiganshire, and to report upon the working in Scotland of the scheme proposed in the Bill, as well as upon the expediency of extending its provisions, with or without modifications, to other parts of the United Kingdom. The Committee have made their report, which has just been issued as a Parliamentary Paper. It appears from it that there was practical unanimity among the witnesses that, having regard to the special circumstances prevailing in Scotland, the working of the Private Legislation Procedure (Scotland) Act, 1899, has been on the whole successful, though many of those who gave evidence expressed the view that the Act should be amended in several particulars. The Committee attribute the success of the Act in a great measure to the fact that the Scottish Office, with its staff of officials, has been able to watch over the proceedings in regard to the Provisional Orders made and the Bills introduced to confirm those passed by the Commissioners. The Committee point out that Wales stands in a somewhat different position to either Scotland or England. She does not possess the machinery to which allusion has been made as contributing to the success of the Scottish Act, and she differs in other respects from Scotland. Moreover, a Bill specifically dealing with Wales has been read a second time without a division; whereas no similar Bill relating to England has been introduced, much less discussed or read a second time. In these circumstances, the Committee do not think the precise procedure which has been found to work successfully in Scotland would be well adapted to Wales. But they are of opinion that the wants and wishes of the Principality should be met by some adaptation of the principles of the Scottish Act—viz., local inquiry, and the devolution of powers to a competent tribunal, subject always to the complete control of Parliament. Having satisfied themselves that there is no general wish in England for an extension thereto of the Scottish system, the Committee adopt the view that, whatever desire or public need there may be for a less costly system, that of Private Bill Procedure could be best met by some extension of the present Provisional Order system. If the powers of the Government Department controlling these Orders were extended so as to embrace all matters of strictly local interest, and if the system were otherwise amended, the chief advantages of the Scottish system—viz., local inquiry coupled with the control of Parliament—would, the Committee believe, be secured in an economical and practical fashion. In conclusion, the Committee state that the evidence given before them strengthened their conviction that in any extension of the system of local inquiry, two fundamental principles must be maintained—viz., the effective control of Parliament, and the complete absence of any taint of personal interest or local prejudice on the part of those who conduct the inquiry or are members of the Commission.

A Prompt Defence of Gas at Newport (I.W.).

The Vicar, Churchwardens, and Sidesmen of the Newport (I.W.) Parish Church have had under consideration since Easter the question of improving the lighting and ventilation of the building. The Isle of Wight Electric Light Company offered to undertake the former work for £150; while the Newport Gas Company submitted a scheme for relighting the church with Kern burners at an approximate cost of £60. Last Wednesday, a circular was issued setting forth the foregoing facts, and inviting an expression of opinion, on a form at the foot of the circular, as to the preference of the parishioners for one or the other of the illuminants named, in view of a meeting to be held to-morrow to receive the replies and take the necessary steps for carrying out the improvements suggested. All this was a perfectly fair and straightforward business transaction. The parishioners had the choice of one of two lights, one costing 2½ times as much as the other; and if they had simply been left to make their selection, we should have said nothing. But the framers of the circular went out of their way, it seems to us, to prejudice the parishioners against the cheaper illuminant; for they said: "We feel very strongly that for public buildings there is no comparison as to the infinite superiority of electric lighting over gas. The air is not so vitiated; there is a much greater degree of enjoyment to those who are present; and health does not suffer as it does when gas is used. Under these circumstances, we recommend the adoption of the electric light." It was not possible for such a statement as this to escape the notice of Mr. Ibbotson, the Engineer and Manager of the Newport Gas Company, who is not only on the alert to defend the Company's interests, but a diligent reader of the "JOURNAL," with the view of adopting any suggestions that may support him in his action. The one contained in last Tuesday's issue with regard to the results of the evidence given by Mr. Hehner and Dr. Rideal before the Departmental Committee on Metropolitan Gas Testing was promptly seized upon by him, and in a letter he was able to get into the local paper on Saturday, he gave the authors of the paragraph quoted, and the inhabitants of Newport generally, a good deal of useful information which enabled them to estimate at their real worth the statements made in the circular. He pointed out that if those who had drafted this document had been properly informed, those statements would never have been made. He gave them a few extracts from Dr. Percy Frankland's report to the Corporation of Birmingham on the lighting of the Art Gallery, to show that with gas lighting there is the motive power for the most natural form of ventilation. The evidence of Mr. Hehner and Dr. Rideal came ready to his hand, and he made good use of it. Of course, where the public health and convenience are in question, cost is a matter of secondary consideration. But when these can be studied concurrently with economy, the system which allows of it is surely the one to commend itself. This system is that in which Mr. Ibbotson and the majority of our readers are interested; and he closed his letter by showing that he could give the same illuminating power and effect in any size units from 20 to 1000 candle power "at less than one-fourth of the cost of electricity, with current charged at the usual Newport rates." Here was something for the parishioners to ponder over. If in face of it they prefer to have the more costly illuminant, it will not be due to lack of information as to the capabilities of the cheaper one. But had it not been for Mr. Ibbotson's prompt action, they would have recorded their votes on a statement which was highly prejudicial to gas.

WATER AFFAIRS.

Papers at the Conference of Water Engineers.

THOSE of our readers who have perused the records of the proceedings at the annual meeting of the British Association of Water-Works Engineers at Hull which have appeared in recent issues, will, we think, agree that the framers of the programme presented a judicious selection of subjects for the consideration of the members, comprising as they did questions of both special and general interest. To the latter, no water engineer can afford to be indifferent; but, of course, they do not touch him so closely as those connected with his daily work. For example, he may be located just over an abundant supply of excellent water in the chalk, which is not likely to be tapped by any poacher upon his preserves. He is therefore, in all probability, more concerned about the best means of lifting this water to the surface, and storing it for future use, than the broader question of the control of the country's water supply, important as this undoubtedly is. Consequently, the papers by Mr. Watts and Mr. Richardson, dealing respectively with reservoir construction and pumping water by the air-lift system, possess special interest for anyone who is so placed.

Mr. Watts, it may be remembered, gave the members the benefit of his views on the use of concrete and puddle in the construction of reservoir embankments. In the execution of such work, stability is, of course, the main consideration. Following the example of the late Mr. Bateman, he prefers concrete to puddle for making the central wall—though it is admitted to be much more expensive in first cost—seeing that it allows of the trench being made narrower. For dams, however, he recommends concrete below the ground, and earthwork and clay puddle above. The author gave

some useful advice in regard to the mixing of concrete, as well as the best method of using it. He considers cement superior to hydraulic lime for concrete which has to bear compression or tension; but for making an impervious core in trenches below ground, lime is, to his mind, as good a cementitious material as cement. As uniformity in the quality of cement is an important factor, Mr. Watts recommends users, pending the adoption of some general agreement among manufacturers as to the fineness to which it should be ground, to confine their orders as far as possible to one firm. The members had a good object-lesson on this part of the paper at the cement-works of Messrs. Earle, two of whose representatives offered some instructive remarks on this matter in the discussion.

On the main subject of the paper, however, Mr. Clemesha Smith expressed a preference for puddle to concrete, where it could be procured of a strong, tenacious nature; as it is more elastic, and can be inspected with greater facility. Mr. R. E. Middleton acknowledged that Mr. Watts had made out a good case for concrete, on the basis of the fact that very much more puddle than concrete has to be used in the trench. But is there any necessity for such thicknesses of puddle? Mr. Middleton thinks not—the puddle being merely a medium to stop the water. In his opinion, a really water-tight wall can be best secured by having a much thicker layer of richer material on the side exposed to pressure. While thanking Mr. Middleton for his remarks, Mr. Watts said he could not agree with him on the matter of narrow trenches, especially as there is very little knowledge in regard to the hydrostatic pressure a cubic foot of puddle will resist. It seems, therefore, that the circumstances of each case must determine the material to be used; and the paper and discussion will prove helpful to those who have to come to a decision on the subject.

The paper published elsewhere to-day is that in which Dr. Thresh dealt with the question of the practical definition of "pure and wholesome water" and "pollution." It is an important one for the water engineer, who is required to send out a commodity which will answer the former description, and consequently be free from elements that affect it in the way indicated by the latter. While he is trying his best to fulfil the statutory requirements in this regard, he is hampered by the diversities of opinion among experts as to what are "purity" and "wholesomeness" in water. Tested chemically, a water may be pronounced pure; but examined bacteriologically, it will be found to contain organisms which indicate pollution. On the other hand, the so-called "pure" water may be polluted; and the condemned water perfectly wholesome. How long is this uncertainty to continue? Dr. Thresh thinks it will not be removed until both chemists and bacteriologists "extend their studies beyond the limits "of their laboratories, and take into account the evidence of "practical experience." There is a volume of wisdom in these words. Take the case of London. For years it has been dinned into our ears that the water sent out for consumption is simply "liquid sewage," and necessarily unwholesome; yet those who have consumed it as supplied —we will not say as taken from foul receptacles—have not been decimated by typhoid fever. Every-day experience has shown that, owing to the extensive system of filtration in use, the water has been so thoroughly purified as to be perfectly free from danger. Dr. Thresh urges that so long as the evidence of experience is ignored, and the character of the source is left out of consideration, we shall continue to have water from dangerous sources passed as pure, and perfectly safe and wholesome water condemned as polluted. The paper was really a plea for an agreement between all parties concerned upon some common standard or some common definition of terms in water analysis; and in the discussion its necessity was emphasized by Dr. Mitchell Wilson, the Medical Officer for the East Riding of York, as well as by Mr. Percy Griffith, the Secretary of the Association, who urged that it was impossible for water engineers to act effectively while there was so much difference among experts. We unite with Mr. Griffith in pleading with them to "hurry up" and find some basis of agreement. If these remarks should lead to an early response to the appeal, the members of the Association will have an additional reason to thank their Secretary and the author of the paper for their efforts to make the proceedings at the annual meeting of all-round practical utility by including in the programme the admittedly important subject we have been considering.

AN APPEAL BY THE CRYSTAL PALACE DISTRICT GAS COMPANY TO THE CONSUMERS.

By a unanimous vote, the Board of the Crystal Palace District Gas Company have determined on a course of action which will set the whole gas industry agog to learn the issue. The step is such a daring one that we know of only one brain capable of conceiving it, and only one iron will capable of putting it to the test. Its nature can be explained in few words. Without the authority of Parliament, without the sanction of the district governing bodies, the Directors of the Company have resolved to put (so to speak) to the arbitrament of the consumers the matters in dispute between them and the Local Authorities, and the matters which they have so abortively (through rancorous opposition) submitted to Parliament at a cost of something like £7000. The Company have been persecuted by the Local Authorities over nuisances which their Act of Parliament compelled them to create through the use of lime purification; and they have been subjected to complaint and litigation over their carburetted water-gas manufacture, which has also been necessary to comply with the requirement of Parliament—a requirement brought about at the instance of the Local Authorities—that they should supply a gas of 15-candle power. On the strength of the recommendation of the Board of Trade Committee that lime purification should no longer be insisted upon, the Board have decided to confine themselves to oxide purification immediately arrangements can be made to substitute it; and they further purpose to abandon enrichment by carburetted water gas, and give the consumers the gas that can be produced from the available coal supply, which means delivering to them a pure coal gas of an illuminating power of about 14 candles. On the other hand, they offer consumers a reduction of price by 1d., to 2s. 5d. per 1000 cubic feet (representing £5000 a year in the pockets of the consumers), the fixing free of the best flat-flame gas-burners obtainable, and the renouncement on the part of the Company of the right, for twelve months, to the additional dividend of 2s. 6d. per cent. to which the reduction to 2s. 5d. entitles the proprietors. This, briefly told, is the action resolved upon; and the position is stated in transparent language in the circular-letter (reprinted below) that has been sent out to all the consumers of gas in the Company's district. In the circular there is nothing said that can be regarded as offensive. It has been drafted with consummate skill, and is a veritable olive-branch.

Now is not the time to discuss how far the decision is ethically or legally wrong. If the Directors can secure for their bold act a fair trial, nothing must be said to prejudice it. On the contrary, we prefer to give a whole-hearted support to Sir George Livesey and his colleagues—the very intrepidness of the proposal takes the fancy—in order that the experiment may receive a fair test. For the trial, we have no misgivings so far as the consumers are concerned; the Local Authorities are the only ones who are likely to oppose it. But we join our voice to that of the Board, and appeal to them to give the experiment a fair field; and so ascertain for themselves whether or not the Company can prove the benefits which they say, and have said for years past, will accrue to the consumers by the change, or whether past hostility to their proposals has any sound foundation. This is the only practical way of settling the disputes of the past. If the Company cannot, through the consumers, justify the reduction of the illuminating power, then it will be easy enough for them to revert to water-gas enrichment at any time.

Of course, it is quite open to the Local Authorities to say that they cannot connive at this breaking of the law. Let the Authorities look at the position squarely in the face. The Company are not, in this matter, acting aggressively. If they were, they would not ask, in their circular, "Will the Local Authorities give the experiment a fair trial?" Under existing conditions, the Company are already violating the law. "To create a nuisance," as the Directors put it, "is to break the law;" and to supply gas of a lower illuminating power than that prescribed by Parliament, even though the deficiency be but a fraction, is a technical offence. Of the two evils, the Directors choose what they believe to be the least. Then, if the experiment is successful, Parliament will undoubtedly be asked, in another Bill, to legalize the lower quality of gas and the abolition of the offensive system of purification. The Company gain no advantage from their action, excepting (assuming they are not met in an insensate spirit) an almost immediate freedom from the vexatious concomitants of present methods. They show that rapacity is not their object, by refusing over the next twelve months any pecuniary advantage; and even then they would not be at all likely to take to themselves anything in the way of increased dividend arising from their present action until Parliament had put their seal upon it, when their monetary gain would be but little more than a tithe of that which the consumers would enjoy. On these grounds, our appeal is added to that of the Directors in asking the Local Authorities not to thrust any obstacle in the path of the experiment; but to join in it in the same spirit in which the Company have entered upon it, and allow the whole body of consumers to decide. Should the consumers be favourable to the change, it will throw a very grave responsibility on the Local Authorities, if they subsequently offer any resistance to it. There is, however,

another side to the question, which, regarding the Company and the Local Authorities as contending parties, equalizes them. The Directors must have great faith in the decision of the consumers, for it follows if they, in the event, should be against the reduction of illuminating power, the Company will find that, in next approaching Parliament for relief in this particular, the burden of difficulty will have been immeasurably weighted by the consumers' verdict, assuming a fair trial of the experiment. Will the Local Authorities allow it to proceed? It cannot be ignored that with them reposes the power of arresting or permitting the experiment, no matter how resolute may be the present feeling and purpose of the Directors.

The following is the text of the circular-letter referred to in the foregoing:—

CRYSTAL PALACE DISTRICT GAS COMPANY.

To the Consumers of the Company's Gas.

LADIES AND GENTLEMEN—

Serious complaints from the neighbourhood of the gas-works have been made, resulting in the legal proceedings by the Lewisham Borough Council for the abatement of certain objectionable processes necessary to the manufacture of gas in accordance with the requirements of the Act of Parliament. The Company has done all in its power; but the complaints still continue to be made. One of them is due to the use of lime for purification, which, in the form of what is known as foul lime, on its removal from the purifiers certainly gives off an objectionable smell that, in the direction of the wind, extends for a considerable distance from the works. Proceedings were taken at the Greenwich Police Court against the Company in 1901 and 1902; and the decision of the Magistrate was that he could not convict because the use of lime was necessary to enable the Company to comply with their parliamentary requirements. Since then further complaints have been made and proceedings threatened. Another cause of complaint is due to the manufacture of carburetted water gas for the purpose of enriching the ordinary coal gas. For this the Company has also been prosecuted by the Borough Council, and a second action has been threatened; but as an appeal on the first is pending, nothing more can at present be said on that point.

At the proceedings before the Greenwich Magistrate in 1902, the Company stated that it was their intention to introduce a Bill in the following session to relieve them from the obligation to use lime, and also to seek relief from the obligation to enrich their gas; and thus abolish both causes of complaint. The Bill was introduced; and a Committee of the House of Commons gave the Company all they asked, notwithstanding the opposition of the London County Council and the Local Authorities. But when it came to the House of Lords, the opposition was repeated, and was successful; the Lords Committee being asked to reject the Bill on the ground that the Board of Trade intended to appoint a Committee to deal with somewhat similar questions in connection with the three large Metropolitan Companies. A similar Bill was introduced this year; but at the instigation of the same Local Authorities, the Board of Trade required the Company to withdraw the contentious clauses of the Bill pending the report of their Committee above mentioned. These two Bills have cost the Company about £7000, and have thus compelled them to keep up the price of gas at a higher figure than would otherwise have been necessary. It may here be stated that the Company is working under what is known as the sliding-scale, whereby the interests of the shareholders and the consumers are identified and made one. A reduction of 1d. per 1000 feet, which saves the consumers £5000 a year, entitles the shareholders to 2s. 6d. per cent. extra dividend, or £719 per annum in the aggregate, and *vice versa*. The officers and workmen of the Company are also brought into the partnership; they receiving an annual bonus on their salaries and wages in the shape of a percentage increasing with every reduction in the price of gas and *vice versa*. Losses and gains are therefore shared by consumers, shareholders, and employees (the latter now all shareholders). All three partners are therefore interested in a low price of gas.

This two years' delay in getting relief from onerous and worse than useless restrictions has placed the Directors in a difficult position. The Board of Trade Committee has reported unanimously and emphatically against the use of lime for purification, in the following terms:—

"That the obligation placed upon the Companies with regard to the removal of the sulphur impurities (other than sulphuretted hydrogen) should be abolished." The Committee found "that only a small percentage (about 7 per cent.) of the gas undertakings in the United Kingdom are required to take these sulphur products out of the gas they supply. Nevertheless, it does not appear that any complaints are made by the inhabitants of other districts on the ground that the gas thus unpurified causes injury to health or is more destructive to articles, such as leather, &c., than it is supposed to be in London. . . . And there is no doubt that the nuisance which is occasioned by the use of lime for extracting these sulphur products is very serious, not only by reason of the annoyance caused to the neighbourhood, but also by the deleterious effect on the workmen employed in connection with the process. . . . The Committee are of opinion that the requirement that the sulphur impurities shall be removed to such an extent as to demand the use of lime should be discontinued. . . . But the Committee do not think that the pecuniary advantage is in itself sufficient to justify them in recommending any consequential reduction in the standard price of gas."

It is necessary to state that these sulphur impurities are infinitesimal in amount, being about 1 part in 700 parts of gas; that there are no known means of removing them; and that the use of lime only reduces them to about 1 part in 1000. Moreover, the evidence given to the Committee by Drs. Hehner and Rideal proved that these minute traces of sulphur in the gas were not found by the most careful analysis in the air of a gas-lighted room; and it may also be stated that the two neighbouring Gas Companies—viz., Croydon and Bromley—are under no obligation to reduce these sulphur compounds. In short, it makes not the slightest difference to the consumers whether these stand at their normal amount or whether they are reduced to some extent as at present.

The question the Directors have to decide is whether they shall continue the lime nuisance until they can get an Act of Parliament—about getting which there is no certainty—or at once abolish lime purification, and thus relieve the inhabitants within half-a-mile of the gas-works of a real ground of complaint. They decide to abolish lime purification as soon as the necessary arrangements can be made to substitute the innocuous oxide of iron, which causes no nuisance.

The other complaint against the Company arises from the manufacture of carburetted water gas, which is used to enrich ordinary coal gas. At the instance of the Local Authorities, some years ago, Parliament required the Company to make gas of a higher illuminating power—viz., 15 candles—than could be obtained from the available supply of coal. At one time enrichment was obtained by a mixture of cannel coal with ordinary coal. But cannel became so scarce and dear that to increase the illuminating power one candle cost 2d. per 1000 cubic feet, or an addition of £10,000 a year to the consumers' bills; and this being out of the question, the only other practical method of enrichment is by an admixture of what is known as carburetted water gas. This enables the Company to comply with the prescribed test; but it is very objectionable on other grounds. It is, if breathed, more injurious than simple coal gas; but this is not the only objection. It is very inferior for heating purposes, and when mixed with coal gas seriously diminishes the efficiency of all gas-fires and cooking-stoves, and causes them to "light-back," while simple coal gas is better for gas-engines and incandescent burners. Seeing that upwards of 70 per cent. of the gas supplied to the consumers is thus used, and less than 30 per cent. in flat-flame burners (which is the most extravagant way of using gas), it is certainly not to the advantage of the consumers to continue enrichment by water gas. As to the flat-flame burners, the Company have made many tests of those in use by the consumers, and find that, when supplying 15-candle gas, those tested gave on the average a light of less than 10 candles.

Some flat-flame burners are, however, much better than others; and to meet this difficulty the Company will, on application, supply and fix free the best flat-flame burner obtainable—that is, the burner that gives the most light per foot of gas used. By far the best course would be for all shops, sitting-rooms, and other places where incandescent burners can be used, to substitute them for the flat flames. This the Company will do at cost price, and will also maintain the mantles at cost price.

The Directors therefore purpose as soon as possible to abandon the enrichment by water gas; feeling certain that, as above shown, it will be to the advantage of the consumers. Concurrently with this alteration, the price of gas will be reduced from the present Midsummer quarter to 2s. 5d. per 1000 feet. This will give £5000 a year to the consumers, which is considerably more than the Company will save by the abolition of enrichment.

The result will be that the gas will contain a minute quantity of sulphur in excess of the prescribed limit, and it will be of rather lower illuminating power than is prescribed. The other alternative before the Directors is to continue the use of lime and the manufacture of water gas, and thus cause inconvenience and annoyance to the neighbourhood for a considerable distance from the gas-works. To create a nuisance is to break the law, as it is also to supply gas below the prescribed standard. Therefore of the two evils the Directors choose the least—in fact, the course they purpose taking they are certain will not be in any way detrimental to the consumers, who will be supplied with better gas for most purposes for which it is used, and will, by the reduction of price, save the £5000 a year; for the nominal reduction of illuminating power will not cause them to burn any more gas, even for lighting, with the better burners the Company are willing to supply.

The standard illuminating power of all the neighbouring Companies—the South Metropolitan, the Croydon, and the Bromley—is 14 candles, or about the quality this Company will supply.

The consumers are requested to give the proposal a fair trial, for the Directors are convinced they will really find it to their advantage; but even should that not be the case, reversion to water-gas enrichment can be made at any time. The Company must satisfy and serve the consumers well, or they will lose business, for gas companies have no monopoly of artificial lighting. The Directors would not act in this way if they thought it would cause dissatisfaction, and they will do all in their power to assist the consumers to use gas to the greatest advantage; for the less gas they use to obtain a certain amount of light, the better it is for the Company in the long run.

One point remains. If, as the Directors believe, the change will benefit the inhabitants in the neighbourhood of the gas-works, and will also give satisfaction to the consumers, will the Local Authorities give the experiment a fair trial? They test the Company's gas occasionally, and will probably find it somewhat below the prescribed standard. If they insist on the fulfilment of the letter of the law, the Directors will have to consider the position, and either pay the fines or revert to the old conditions and increase the price of gas.

It is right to add that for the next twelve months the Directors will not pay the additional dividend of 2s. 6d. per cent. to which the reduction to 2s. 5d. per 1000 feet would entitle them.

GEORGE LIVESEY,
Chairman.

July 1, 1904.

At the first meeting of the Council of the Society of Arts for the new session, Sir William Abney, K.C.B., D.C.L., was elected Chairman for the ensuing year.

Mr. Ludwig Mond, F.R.S., has had conferred upon him by the Manchester University the honorary degree of D.Sc. Professor Schuster, in making the proposal, referred to the gain to commerce by Mr. Mond's researches, and said that a great deal of his work had advanced pure science to a considerable degree. He thought their list of Doctors of Science would be increased in eminence by the addition of Mr. Mond's name.

REPORT OF THE CHIEF INSPECTOR UNDER THE ALKALI ACTS.

The Annual Report of the Chief Inspector under the Alkali, &c., Works Regulation Acts, 1881 and 1892 (Mr. R. Forbes Carpenter), was issued last Tuesday. It is the fortieth of the series, and it gives an account of the work done during the past year. As a record of independent research in a field of investigation with which gas managers are concerned, we have no hesitation in saying that it has not been surpassed in interest by any of its predecessors. In the present article, we deal with the report of the Chief Inspector, which is made to the Local Government Board; leaving for a subsequent issue the usual notice of the principal features of the District Inspectors' reports and that presented to the Secretary for Scotland.

The number of works now registered under the above-named Acts in England, Ireland, and Wales is 1034. Of these, 75 only are works decomposing salt, and so scheduled as alkali works, while the remainder carry on processes which are scheduled, or subject to registration, under the Acts. These numbers show a reduction of 10 scheduled and registered works; while the number of alkali works remains at 75, as in 1902. There are also 127 works registered in Scotland; bringing up to 1161 the total number in the United Kingdom. The inspectors paid 4838 visits to works, and carried out 5211 tests, compared with 4946 visits and 5091 tests in the year 1902. In one case it was necessary to take proceedings to recover the penalty for an infraction of the provisions of the Act of 1881; and a fine of £20 was imposed.

The section of the report devoted to alkali waste works contains a long account of the investigations carried out by Mr. Carpenter's assistant (Mr. S. E. Linder, B.Sc.) to determine the conditions most favourable for the complete absorption of sulphuretted hydrogen and sulphur dioxide by waste slurry, either alone or in conjunction with added lime. Another set of experiments carried out by Mr. Linder bore upon the testing of acid gases escaping from the chamber process of sulphuric acid manufacture, in regard to which some details were given in the preceding report. By the courtesy of a firm of manufacturers at Silvertown, he was enabled to make some further investigations on the reactions in the sulphuric acid chambers and connections at various points. The progress made so far is recorded; but it has not been found possible to continue the experiments this year. In connection with this subject, Mr. Carpenter points out that precautions are necessary when different absorbents for the residual acid gases are being critically compared for efficiency, and when different indicators are used, also comparatively. In the latter case, the solution to be tested should, he says, be divided into two parts, and each tested separately under the conditions known to be suitable for the indicator employed. In comparing acidimetric estimations, using phenolphthalein and methyl orange respectively as indicators, regard must be had in using the former to the error introduced into the result by carbonic acid, if the solution is not titrated at boiling heat. The importance of this has sometimes been overlooked; and evidence appears from time to time in technical literature that the point needs to be emphasized.

Passing on to the section of the report in which Mr. Carpenter deals with works producing sulphate and muriate of ammonia and dealing with gas liquor, we learn that the number of these works continues to increase; the tendency being for the residual products of gas-works to be manufactured thereon, and not disposed of to a contractor. The difficulties and objections which were formerly considered to attach to these operations have lessened with the spread of knowledge and experience; and the processes now number 466, or 31·9 per cent. of the total of 1459 under inspection. Details of the progress made are furnished in the District Inspectors' reports. Mr. Carpenter enters at considerable length, in a subsequent portion of his report, into the subject of the studies made last year on the Claus reaction, both in the gases arising from the distillation of gas liquor and from the Chance process of desulphurizing alkali waste. At this point, he merely directs attention to certain sources of possible loss of ammonia in the saturators connected with sulphate of ammonia manufacture which have come under notice from time to time, and to which naturally attention was directed in some cases where tests were made of the gases escaping from the Claus process. Mr. Carpenter says saturators have been found designed with so steep an angle in the bottom from back to front, that when there is ample depth of acid in the front of the saturator, where the sulphate formed is withdrawn, the ammonia distributing pipe in the closed portion at the back is either unsealed, or has too small a layer of acid liquor above it to ensure neutralization of the ammonia passing. This defect, in one instance, led to the discarding of a new and expensively constructed saturator. Similar losses may occur from neglect of the attendant to maintain sufficiency of acid at any period, especially when the level of liquor in the saturator is being lowered by the withdrawal of the salt; also from the gradual enlargement of the holes in the ammonia distributing pipe, after the lapse of time, causing the vapours to issue through the acid in too great volume at particular points, so that acid and ammonia are not in actual contact. It is pointed out that in some works the liability to losses of this character is recognized, and provision is made for scrubbing the gases, after leaving the saturator, with fresh sulphuric acid flowing to the saturator in a suitably devised arrangement for bringing the gases into close contact with thin films of acid. This concerns the manufacturer from the economic point of view; the presence of escaping ammonia, so far as the inspector is concerned, not adding any difficulty to the problem of dealing with the residual noxious gases escaping from the process.

We now come to one of the most interesting features of the report, from the gas manager's standpoint. Through the courtesy of manufacturers, Mr. Carpenter is able to present the figures showing the produce of ammonia from all sources in the United Kingdom. They are as follows:—

—	1903.	1902.	1901.
Gas-works	149,489	150,055	142,703
Iron-works	19,119	18,801	16,353
Shale-works	37,353	36,931	40,011
Coke-oven works	17,438	15,352	12,255
Producer gas and carbonizing works (bone and coal)	10,265	8,177	5,891
Total	233,664	229,316	217,213

It will be seen that the most important contributor is still, of course, the gas industry. There was a slight reduction last year from the output of 1902, due entirely to a considerable decrease having taken place in Scotland, where upwards of 1500 tons less sulphate was produced by the gas industry. Mr. Carpenter says it would appear as if in 1903 less coal gas was made in the large centres of manufacturing industry in the Midlands, Lancashire, and Yorkshire, as the condition of the oil market was not considered favourable to the operation of carburetted water-gas plant, except in special localities. In London and the southern and eastern counties, on the other hand, a substantial increase took place. The figures show considerable increases in the quantity of ammonia recovered from coke-ovens. Further, more producer-gas plants have been erected, with recovery of ammonia; so that the last item in the table again shows an increase. A slightly greater activity is also noticeable in works carbonizing coal for the production of coke, tar, and benzol. Mr. Carpenter concludes this portion of his report by pointing out that the application of ammonia recovery to coke-ovens using South Wales coal will be an accomplished fact in the course of the current year. If the pioneer plant gives successful commercial results, he says that a considerable field lies open to the extension of the process in that busy metallurgical district. More plant of this character will start in the present year in Yorkshire, the North of England, and in Scotland.

A large portion of the report is devoted to the presentation of the results of analyses of various ammoniacal liquors, in continuation of those which have appeared from time to time in previous reports. As Mr. Carpenter considered that all the useful laboratory investigation and review of analytical methods had been accomplished in this intricate subject, he asked Mr. Linder to summarize the conclusion finally arrived at. This he did, and his Chief expresses his great indebtedness to him for the skill and zeal with which the difficult problems were attacked and solved —at least, so far as seems at present to be possible. These matters are fully dealt with elsewhere (p. 106).

A large portion of the report is devoted to the investigations carried on by the Chief Inspector and some of his assistants in connection with the Claus kiln reaction. The consideration of this subject was commenced in the report for the year 1902, in which the results obtained by examination and test of the Claus kiln at Granton were given. The subject of the heat reactions, theoretically considered, formed part of the investigation required. Later the research was continued in other works dealing first with foul gases from gas liquor and distillation, and secondly with the gases from the Chance process for the recovery of sulphur from alkali waste. The results of the calculation of heat reactions and of the sulphur loss in the latter process were laid before the Liverpool Section of the Society of Chemical Industry in March, 1903, and were noticed in the "Journal" shortly afterwards. Mr. Carpenter reproduces the substance of much of this paper, which he says was really prepared with a view to its presentation in his annual report; but in the latter the subject is treated from wider points of view, and as the result of numerous experiments subsequently carried out. Later in the year, in addition to some experiments conducted by Mr. Young (one of the District Inspectors), with the assent and co-operation of the Newcastle and Gateshead Gas Company, it became possible, thanks to the courtesy of Mr. Alfred Colson, of Leicester, and of Sir George Livesey, to conduct fairly exact experiments on the question of sulphur loss, based on an examination of the inlet and outlet gases, to compare with the results of similar losses as ascertained by the practice in the Chance-Claus process, where routine testing of both inlet and outlet gases is regularly practised. These researches have thrown a good deal of light upon the subject under investigation; and all who are specially interested therein will do well to study the results tabulated in the report. Mr. Carpenter and Mr. Tinder presented to the Society of Chemical Industry in the spring the second part of the paper above referred to, a long extract from which, covering the later experiments, will be found elsewhere in the present issue of the "Journal" (p. 112).

It only remains to notice a portion of the report dealing with tar-works. Mr. Carpenter says the process of which the supervision was added to the inspecting staff by the Act of 1892 still remains the one which is by far the most widely spread throughout the country. The number of works where tar distillation or heating in any manufacturing process was carried on last year is 131. In one additional works, the continuous still of Mr. Lennard was adopted. Referring to the subject of the precautions necessary in conducting this manufacture, Mr. Carpenter calls attention to the rules issued by the Home Office pointing out the risks run by workmen in carrying on the various operations. These rules, which were given in the "JOURNAL" for the 17th of November last year (p. 428), are entirely in harmony with the warnings so frequently conveyed in the Chief Inspector's reports as to the isolation of stills, during the process of chipping out and cleaning, from others working in the series.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see p. 140.)

THE turn of things on the Stock Exchange last week was decidedly disappointing. Anticipations had been formed of money being superabundant; but early in the week the error of these was discovered. Consols and the gilt-edged division in general shrank persistently; and the failure of the Cape Loan to take with the public aggravated the situation. However, the position was somewhat relieved before the end of the week, and the close was brighter. Business was, of course, on a very light scale; and the attractions of Henley and Lords exercised their usual power to make absentees. In the Money Market, after an easy day or two, the position became decidedly tighter; and, in view of the early requirements of this week, it closed firm. Discount was firm, without much activity. But while the chief departments were prejudicially affected, the Gas Market took a line of its own, and was more active than in any week for some little time past. Very few changes in quotations occurred; but the general tendency was favourable, and prices were much better. In Gaslight and Coke issues, the ordinary, after hanging fire for a day or two, had quite a revival of energy, and was actively dealt in every day at steadily improving figures. The lowest mark of the week was 94, and the highest (which was the closing transaction) was 95¼. The quotation was thus advanced a point. Moderate business was done in the secured issues, which were unchanged. In South Metropolitan also, there was a renewal of activity; the range of prices being from 125 to 126⅜. Nothing at all was recorded in Commercials. Business in the Suburban and Provincial group fell back, and was quieter than before. Movements in the London market were a rise in Bromley "B," and a fall in Alliance and Dublin. In the local Exchange, Liverpool "A" and "B" had an advance. Business in the Continental Companies was more active, and the general tendency was firm. The undertakings in the remoter world offered nothing to call for comment. In the Water Companies, there was some business transacted, mostly at good steady figures; but Southwark "D" had a set-back of five points. An interesting item was the report of the Water Board that they had practically concluded negotiations with the Companies in regard to the stock to be accepted by them in lieu of cash, and that the amount of money that would have to be provided ultimately was likely to be inconsiderable.

The daily operations were: Gas opened only moderately active on Monday, but prices were good. Gaslight ordinary advanced 1. Tuesday's transactions were even more restricted, and quotations did not vary. On Wednesday, there was an accession of activity, especially in Imperial. Alliance old receded ½. In Water, Southwark "D" fell 5. Thursday was a little quieter. Bromley "B" advanced 1½. Friday and Saturday were both busy days, especially in Gaslight ordinary; but all quotations closed without further variation.

PERSONAL.

After a period of 31 years' service, Mr. THOMAS WEBB is, at the end of this month, resigning his position as Engineer and Manager to the Staines and Egham District Gas Company.

Mr. JAMES MACKAY, Assistant in the Manager's Office of the Glasgow Corporation Gas Department, has been appointed Manager of the Montrose Gas Company, in succession to Mr. T. D. Hall, who is retiring. The appointment was made by the Directors, and is subject to confirmation by the shareholders, who meet this week. Mr. Mackay is a native of Glasgow. He served five years as an apprentice with Messrs. Edward Collins and Sons, engineers, of Kelvindale, Maryhill, and about eight years ago entered the service of the Corporation of Glasgow at Dawsholm. For some time he has been employed in the Manager's office. He has thus had full experience of both the working and the constructional sides of gas production. He holds various certificates for subjects bearing upon gas manufacture, including one from the City and Guilds of London Institute.

ELECTRIC LIGHTING MEMORANDA.

The Favouritism of the Board of Trade—The Provisions of the Electricity Supply Bill—Gas Companies and Local Authorities under One Flag—The Objections.

THE keenest interest was taken in the two sittings last week of the Select Committee of the Lords who have been entrusted with the consideration of the Supply of Electricity Bill, which is a promotion of the Board of Trade. The almost unique spectacle of seeing gas companies making common cause with municipal authorities against a new parliamentary project is something which must not go unchronicled. It has happened in this case. While the opposition of the municipal bodies has behind it, in a measure, the fear of competition, they are at one with the gas companies in objecting to the extension of the powers of the Board of Trade in respect of Electric Lighting Provisional Orders. But the Gas Companies go a step further, and object to the Bill on the ground of the preferential treatment that it metes out to electric lighting undertakings. The Bill shows in an illustrious manner the sweet fostering care that Whitehall has ever had in regard to things electrical, to the length of injustice being done to other industries. While the Board were amplifying their powers in respect of Electric Lighting Orders, it might have had some effect in disarming hostility from one side if they had remembered to ask the authority of Parliament to order the insertion in municipal Electric Lighting Orders of the Bermondsey (or Duke of Northumberland's) clause, and one giving owners of subterranean property the right to compensation for damage done by vagrant electric currents. The opportunity was favourable. But we might just as well expect Big Ben to fall as the Board of Trade to "see fair" over these matters.

The Bill has not received a great amount of publicity; and it may be useful to show the character of the principal clauses, and wherein objection is raised to them. In the first place, the Bill will empower the Board to make Provisional Orders for the compulsory acquisition of land for generating stations, either within or outside the area of supply, and for the breaking-up of roads, &c., for the purpose of enabling electricity to be brought into the areas of supply from outside generating stations. Exception is taken to this clause because such power of purchase involves the right to break up streets and roads in the district of any local authority. Only once—and that through one Parliamentary Committee this session—has a gas company got anywhere near obtaining compulsory powers for the acquisition of land; and this success might have been negatived if it had not been the subject of subsequent agreement before it reached the Committee of the second House. Why electricity companies should be placed in a more favourable position, passes understanding. Another objectionable feature is that the Bill will have the effect of giving the undertakings power to interfere with gas-pipes, although those pipes may not be in the area of electricity supply, but between that area and the outside generating station. All these are matters that can be dealt with far better by Bill than by Provisional Order. The Board, however, hold that, by an extension of their powers, greater uniformity will accrue; other people are under the impression that greater injustice will be done. There is a vast amount of hazard in trying to obtain justice in an Order when it comes up for confirmation, after the Board have put their seal upon it.

The Board are also enabled by the Bill to make Provisional Orders authorizing a company to supply electricity in bulk, and, if considered desirable, to make compulsory the supply in bulk to a local authority or company. There is nothing very objectionable about this; but another clause of three sections has created quite an amount of consternation. By it, in the first place, the Board may exclude the application of the power of purchase given by section 2 of the 1888 Act, in respect of the whole or any part of any undertaking authorized after the passing of the Bill to which they may consider it inapplicable for various specified reasons. But the power of purchase given by the section referred to is extended so as to authorize the purchase of any generating station, cables, &c., used solely for supplying electricity for the purpose of an undertaking, notwithstanding that they are located outside the area of supply. The clause also contains a section which is not likely to be required very frequently, enabling a local authority who have power to purchase the part of an undertaking within their district to transfer this right to another local authority who have power to purchase another part of the same undertaking. But the provision is made that they must first obtain the consent of the Board and of the company owning the undertaking. It was contended over and over again before the Committee that these are matters that should be dealt with by a Parliamentary Private Bill Committee, and not by a Government Department.

Further, the Bill proposes to allow local authorities to combine for the purposes of the Electric Lighting Acts; and it also repeals the first part of section 1 of the 1888 Act, and authorizes the Board of Trade to grant Electric Lighting Orders, at their own discretion, without the consent of the local authority. This power the Board possess at the present time; but if they exercise it, they are obliged to state their reasons for doing so in their report to Parliament. Obviously the object of the Board here is to do away with the necessity of making a report. The fear of competition no doubt animated the local authorities over this particular provision;

and the Board have answered the objection by announcing their willingness to insert a proviso to the effect that a company who propose to compete with a local authority already supplying electricity will have to obtain the consent of the local authority under the 1888 Act. This brief review shows, in a general way, the objects of the measure, and the nature of the opposition to it. The preamble was declared proved at the sitting of the Committee last Thursday, and now interest will be centred upon the action of their Lordships in connection with clauses. Of course, the Electricity Companies have given the Bill their benison. [As the "JOURNAL" was going to press yesterday, the information was received that the Committee were prepared to accord protection to gas companies, and a clause is to be brought up later. We presume the protection only refers to interference with gas-pipes.]

THE GAS CONGRESS AT ST. LOUIS.

THE last number of the "American Gaslight Journal" to hand contains an article on the above subject specially prepared for that publication by "W. F." It appears from it that the expectation entertained in certain quarters that many of the members of the Western Association, whose meeting was to be held first, would be conspicuous by their absence, was not realized. About 200 gentlemen connected with this and sister Associations assembled to hear Mr. Shelton deliver the Inaugural Address which was dealt with in the last number of the "JOURNAL." Something above the usual run of addresses was looked for; and his hearers were not disappointed. The writer thinks there will not be general agreement with Mr. Shelton on the question of the proper recognition to be given to the deceased members, inasmuch as obituary notices are usually so overdone that they fail to differentiate between the feelings of an Association upon the loss of an old, loyal, and hard-working member, and that of one who never attended, but simply paid his subscription. Mr. Shelton's plan of trusting the writing of the obituary notice to an intimate friend of the deceased is considered to be preferable to referring all the names to one Committee. At the same time, a certain amount of editing would probably be required. With regard to the work of the various Associations, the writer thinks Mr. Shelton voiced what has been more and more in the minds of gas engineers of late years, especially since the recent amalgamation in England. It is generally recognised that some plan of union must be formulated in order to stop the waste of effort incidental to the existence of several Associations, and put the gas engineer in the same rank in this respect as the civil, the mechanical, and the electrical engineer.

Reference to a possibly united Association for America, led the writer to discuss the question dealt with by Mr. Doherty, in the paper he prepared for the congress, the principal points in which were mentioned in the article on "An Ideal Gas Association" given in the "JOURNAL" last week. When it is borne in mind that both Mr. Shelton and Mr. Doherty were writing independently, and necessarily in ignorance of the line each would take, the conviction seems to force itself upon one that there is some justification for the surmise of the writer of the article—that there exists a necessity for a union of the various Gas Associations in America. For the immediate success of such a union, it is pointed out that very much will depend upon the composition of the Commitee of two members from each Association and three members from the gas interests outside, to be appointed by the various Presidents, to draw up a scheme of union for submission to the several bodies. It is thought that union is bound to come; and whether it will be soon or late rests largely with the leaders of the profession. "Union," says the writer of the article, "is certainly the key-note struck by the congress; and most of those who heard Mr. Doherty's paper, and voted on the motions designed to put its recommendations into effect, must have been thrilled by the thought of the work possible to a Gas Association truly national."

Coming to the business of the congress, in the absence of the Chairman of the Committee (Mr. C. J. Russell Humphreys), the first session was opened by Mr. Rollin Norris, of Philadelphia, the President of the American Gaslight Association. During the sessions, the other presiding officers were Messrs. Shelton, Stone, Aldrich, and Pratt, representing respectively the Western, Ohio, Pacific, and Wisconsin Gas Associations. In his address, Mr. Norris clearly indicated the lines along which further economies might be effected in present practice, and where new processes could be expected to improve results. Then came Mr. Shelton's paper on "The Labour Question," which was much to the point. Mr. Shelton treated the subject very ably, and indicated four steps which gas managers should take. The first was to have regard to the physical comforts and pleasures of the men; the second to consider the advisability of forming mutual benefit associations; the third, the institution of profit-sharing; and the fourth the adoption of full partnership. The author remarked that these steps were not to be taken lightly; but he pointed to the experience of Sir George Livesey as showing that success is possible along the front line of progress, where the pioneer has capacity and courage. A paper bearing upon the improvement of the condition of the employees was read by Mr. Lotz. It was on the "Ventilation of Retort-Houses." Unfortunately, the programme prepared for the Congress was too full to allow of all the subjects being adequately discussed in two short sessions.

WITH THE WATER ENGINEERS IN BELGIUM AND FRANCE.

WE are approaching the end of the report of the technical proceedings at the recent annual meeting in Hull of the British Association of Water-Works Engineers; and now the time is opportune for giving some account of the extended tour which the members and a few ladies made principally in Belgium. Some of the friends of the Association, in their affectionate regard for its interests, feared, some time since, that those who planned this large Continental trip were over-estimating the strength of the organization—that, in other words, the supplementing of the annual meeting by such an ambitious-looking excursion would work some mischief on the former, or would itself be a failure owing to its proximity to the meeting and the length of time that the double engagement would entail absence from duty. But neither the one nor the other happened. Our account of the meeting in Hull has shown that, under the presidency of Mr. F. J. Bancroft, and through the benign co-operation of the Water Committee whom it is his pleasure to serve and of the contributors of a series of papers of high technical merit, the first part of the programme was a success without blemish; and the second section of the programme, though differently constituted, was a reflection in this respect of the first part.

It was a goodly party that left Hull on the Saturday after the meeting *en route* for Antwerp. With a few members who joined at Harwich, and a small number of ladies—a larger number would have enhanced the enjoyment—the muster was about 75. It was a numerous company to pin down to the discipline of an organized tour of some length both in regard to distance and time, and the programme for which required loyal compliance, item by item, by every member of the party. And, be it recorded, there was no failing on their part. But the carrying out of the programme was only one thing. There was the preliminary detail of organization; and this was no light matter. It devolved upon the Secretary (Mr. Percy Griffith), and his grip of essentials revealed to the members that they had been in very safe hands, before they had themselves given many thoughts to the matter, beyond the anticipation of the pleasure that they booked by merely signifying their intention to share in it. Talking about the preliminary details, the travelling and hotel arrangements were placed in the hands of Messrs. Cook and Son; and as it is becoming a not uncommon thing for societies of various kinds to take themselves abroad in these days of facile travelling, it is not out of place to say here that the Council of the Association were perfectly satisfied with the admirable arrangements made on this occasion. There is a little wrinkle in connection with the experiences of the Association that may be useful hereafter. The idea emanated from Mr. Griffith that the whole of the luggage should bear a distinctive label, specially printed and displaying the number previously allotted to the owning member, and that an attendant from Cook's should take charge of the luggage at Antwerp and from hotel to hotel during the tour. This arrangement, though perhaps it will not strike one as anything extraordinary as described, added immensely to the comfort of the party, and saved all the wild rush for luggage that is frequently experienced on such tours. Another excellent arrangement was that the book of coupons issued covered every item on the programme, even to gratuities and the incidental expenses. These are of the little aids to the making of a big success of an event of this character. The journey, too, from Hull was made in reserved carriages, dinner was served *en route*, and, on reaching the boat at Harwich, every member found his berth or berths already entered to his name. This was indeed comfortable travelling.

Antwerp was the end of the first stage; and the grand ancient and modern city was reached about 9 o'clock on the Sunday morning. This early hour gave the visitors (who were quartered at the Grand Hotel) ample time to prepare for their first appointment, which was a reception by the Burgomaster at the Hôtel de Ville. His cheery greeting and admirable address (which was interpreted by Dr. Kenma, the General Manager of the Antwerp Water-Works Company) put the members in possession of the fact that they were in the centre of much friendliness for Britishers; and the journey's prospect was thus opened to them in brilliant colours. Right heartily, they toasted the Burgomaster in sparkling champagne. The afternoon was devoted to rest by many; but not a few set about exploring the city. In the evening there was a dinner, on a magnificent scale, at the Zoological Gardens; the hosts being the Chairman and Directors of the Antwerp Water-Works Company. To them—to their exceeding kindness and to the exercise of their influence, not excepting in both respects the genial Dr. Kenma—much is due for the principal items in the programme, which was complete in its technical interest and its provision of entertainment. At the dinner, the Chairman of the Water Company, Mr. Easton Devonshire, Assoc. M.Inst.C.E., presided. He is, as is also Dr. Kenma, a member of the Association; and not only did he gracefully perform the duties which his position as the head of the Antwerp Water Company brought upon him, but he wrote two interesting pamphlets for the occasion describing the Company's works and those of the municipal and suburban services of Brussels. The dinner was a generous treat; and the speeches afterwards disclosed to the members that they had an orator of no mean ability in Mr.

Devonshire, and that Antwerp has also one of a like order in the City Engineer, M. Royers. It was about eleven o'clock when the enjoyable entertainment was brought to an end.

On the following morning, the party were driven round the fine docks of the city; and after inspecting them (including the hydraulic power station which supplies power to the cranes on the wharves) they were fully prepared to endorse the words of the guide-book that Antwerp occupies "the leading position among the ports of the Continent of Europe." In this visit, M. Royers kindly undertook the duties of cicerone. After lunch, the splendid Waelhem works of the Water Company were visited. There Mr. Devonshire and Dr. Kenma shared in the piloting of the party; and they had much to show. We shall be giving in due course some particulars from the special description of the works prepared by the Chairman; but, meanwhile, it may be mentioned that one of the most noteworthy features of the works is the filtration of the water which is taken from the river, the water of which strikes the eye as being about as abominable stuff as it is possible for the source of a city's water supply to be. The filters themselves are not in any way special; but what is special is the method of admitting and drawing off the water. The system is of Dr. Kemna's own devising; and it is based on his practical investigations of the biological effect of the sand. It is a subject to which the Doctor has given profound study; and the transactions of the Association and the health records of Antwerp bear luminous testimony to the fact that he is a benefactor to hygiene through the science of water purification. A system that converts the foul-looking water of the Nethe into a water of high purity for domestic purposes, as proved by the infallible index of the health returns, is a system that is good, and must command attention.

It was with almost regretful feelings that the company left the city in which they had been made so welcome, for Brussels, which formed the second stage of the tour. Tuesday morning was spent in a drive round the city, the magnificent Palais de Justice being included in the sights. Pursuing the programme, they drove to the celebrated Bois de la Cambre, their destination being the municipal water-works. There they were taken in charge by the Chief Engineer of Public Works (M. Putzeys). These works, like those at Antwerp, will receive fuller treatment as early as possible. There was one feature that specially struck the members. To avoid the unsightly appearance of a chimney at the entrance of the Bois de la Cambre, the pumps at this station are driven by gas-engines. The former are fixed at the bottom of a very large well, and are operated by ropes driven by the gas-engines at the surface level. The plant is completely in duplicate. M. Putzeys gave some figures in regard to the cost of pumping by this means; and so far as was understood, they were exceptionally low. These pumps, by the way, are only for dealing with a portion of the supply, the bulk of which is by gravitation. Then the party were taken to two different headings in the Bois, to which access was obtained by shafts with winding staircases; and in both cases the water was seen flowing into a gauging chamber, with a weir—constant records being taken of the flow. A point that was emphasized and made clear to the visitors was that the water is collected by headings driven in the sand; and that there is a peculiar system of shutting the water back, so as to form a natural underground impounding reservoir. An underground dam is quite novel to English water engineers; but they report in Brussels that in this case it secures to them a storage in the sand of water which would otherwise flow away and be lost. These are one or two of the features of special interest that arrested the attention of the visitors. Subsequently, luncheon was served in the Laiterie; and this was succeeded by a drive round the Bois. The afternoon found the party at the new Boitsfort reservoir of the Compagnie Intercommunale des Eaux, which is an undertaking specially formed for the supply of sixteen communes in the suburbs of Brussels. This particular reservoir is practically for distribution purposes only; and the water is supplied to it by gravitation from the Company's works in the valley of the Bocq. The reservoir has been constructed in four sections to facilitate cleaning; and one section was specially emptied, so that the party could go down and inspect the inside. They felt specially grateful to those in authority for having put themselves to this inconvenience for the edification of their visitors. The plans of the works were exhibited and described by M. van Meenen, Chairman of the Company.

This completed the interesting arrangements mapped out for Brussels; and train was taken for Yvoir, where the company arrived early in the evening. The following day was a long one. The whole of the members (including the ladies) bestirred themselves to such an extent that they had breakfasted and were prepared to commence their wanderings by 6.45. By train to Sovet was the first arrangement, and then the travellers found before them a fairly long walk to inspect the Brussels (Intercommunale) Water-Works in the Bocq Valley. The walk was partly through one of the headings driven in the sand, with the floor so arranged as to admit the water. It was to many a curious experience walking along the iron-plated floor with the water flowing underneath. The heading passed through was only an example of several of the kind. These are the works supplying the Boitsfort reservoir, many miles away, which had been inspected the previous day. The water was found to be of an extremely fine quality, as was also the treatment which the members received at the hands of the Chairman and officials. From the works, the party went forward to Ciney, where those who could not indulge in the pleasure of the extended tour for which arrangements had been made, took their leave—journeying back *viâ* Brussels, for Antwerp, where they re-embarked for home.

But those who were fortunate enough to be able to continue their travels to the week-end, took train for Rochefort, lunched, and then drove to the celebrated Grotto de Han. The afternoon was looked upon as a holiday. But the early rise, and the long morning walk, did not make the charm of "doing" the Grotto so apparent as perhaps, under other circumstances, it would have been. It was felt the Grotto was "doing" the members somewhat. The tour all through the galleries meant the traversing of some 1½ miles, up steps and down ladders, through clean paths and through others of muddy surface. The first part of the walk was comparatively uninteresting; but compensation awaited the weary travellers in the magnificent cave at the end. Much welcomed rest was found in the train journey between Eprane and Dinant, where the evening was spent.

The morning of the following day—Thursday—was occupied by a visit to the pipe foundry of the Société Anonyme Metallurgique d'Aubrives et Velerupt. This is the foundry that Mr. A. G. Cloake referred to some time since in a paper on the casting of pipes that he read before the Association. These particular works are the smaller of the two works of the Company; the larger and more modern ones being at Villerupt. Still the visit had its interest. Several moulds were poured, and several castings were drawn from the pits; and no one could fail to notice how exceedingly clean were the castings. The method of admitting the metal through a small annular orifice was pointed out; and it did not take the engineers present long to appreciate the advantages of this. Luncheon on a liberal scale was provided, at which the Managing Director (M. Jacquemart) and Madame Jacquemart presided. Courtesy was shown the visitors on every hand. M. Jacquemart himself, with a large number of assistants, guided the members about the works, some very complimentary speeches were made, and the works band discoursed charming music. The occasion will be long impressed on the memory; not the least by the simple and good-natured enthusiasm of the people residing in the neighbourhood of the works. The journey was then made to Liége.

The last day of the prescribed tour was Friday. About 9 o'clock, train was taken for Dolhain, and then on to Goé Bethane, whence a visit was paid to the famous Gileppe Dam of he Verviers Water-Works. The dam is situated in one of the most picturesque valleys ever seen. The weather was perfect; and the members walked right up the valley to the top of the dam, where they were received by M. Sinet, the City Engineer of Verviers. He exhibited the plans of the work, and explained them fully to his visitors. From the top of the dam, the view was magnificent. On the one side was the vast expanse of water—some 8 or 9 miles long, and, on the other, the richly wooded valley. The dam itself is conspicuous for its great thickness in proportion to its height. The gauging chamber and weir and the valve-house were all inspected. Then there was a little leisure for refreshment before returning to Verviers, where luncheon was taken. From here, the homeward journey commenced, *viâ* Antwerp—London being reached early on the Saturday morning.

Before closing this necessarily brief account of the delightful trip, although it is, as a rule, invidious to specially distinguish between those who are principally connected with such an event as this, the names of Mr. Easton Devonshire and Dr. Kemna must receive special mention for all their kindliness and enthusiasm, which contributed so much to make the trip what it was. They greatly relieved the President (Mr. F. J. Bancroft) and the Secretary (Mr. Percy Griffith); but both these gentlemen did not, in consequence, neglect any one of their official duties. They were energetic to a degree, and at every turn were first mindful of the comfort of the rest of the party. It is now hoped that the future may see an organized visit to this country of the engineers who received the Association on this occasion. Their welcome would, let us assure them, be of the same high grade of heartiness which they extended so liberally to their British visitors.

It appears that there are still in use at Versailles cast-iron water-pipes dating from 1664 to 1688. The total length of these pipes is 15½ miles. A large proportion are 20 inches in diameter; the remainder being 12⅝ inches. They have been laid in lengths of 40 inches, and are coupled by means of flanges and bolts. The 20-inch pipes are 1⅜ inches and the others ⅞ inch thick. The only repairs still found necessary consist in replacing from time to time the bolts, which rust through; but even this slight attention is seldom required.

We learn that 24 ovens in the new Semet-Solvay plant of the Milwaukee Coke and Gas Company have begun operation, and that the remaining 56 will be started soon. Each of the ovens requires, every 24 hours, 7½ tons of coal; and the product of the 24 ovens now in operation runs to about 130 tons of coke a day. When the 80 ovens are working the daily product will be between 450 and 500 tons. The gas now generated by the ovens is being used to heat the newer ones; but there will be a surplus of about 3 million cubic feet of gas a day, of which the Company desire to dispose.

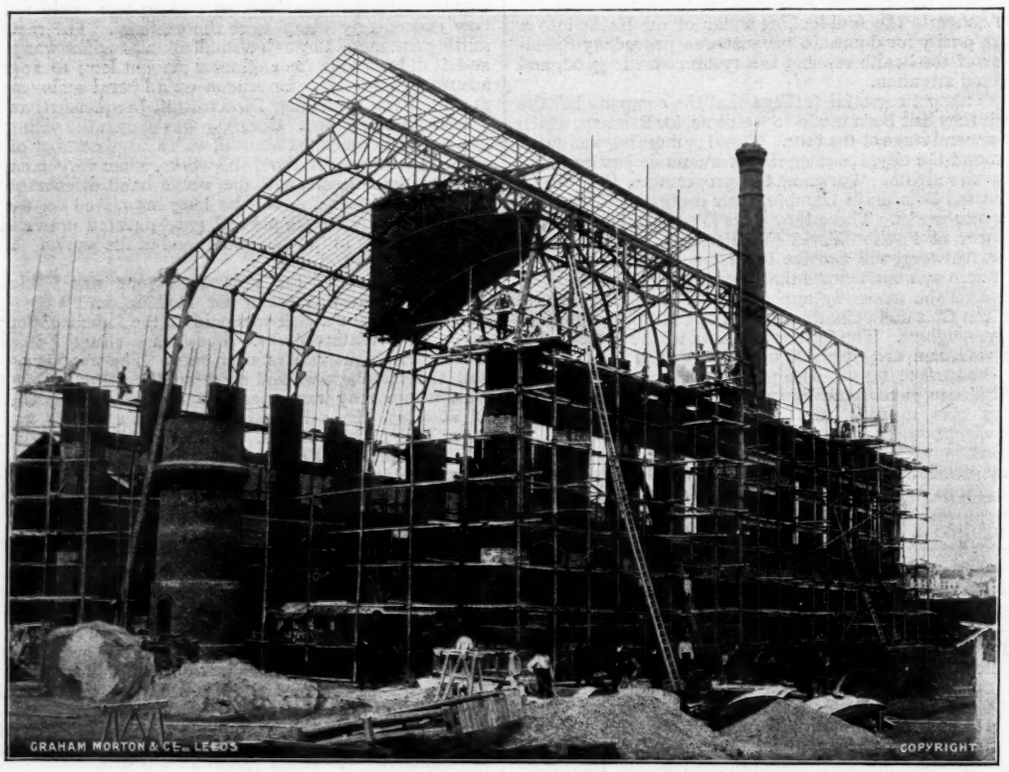
THE NEW GAS-WORKS AT NANTERRE, NEAR PARIS.

The correspondence that has been appearing in the "Journal," and which was provoked by what some people may think were the (through circumstances) untimely references of Mr. H. E. Jones to the Derval settings of inclined retorts at Nanterre, has invested these new works with rather more than ordinary interest; and therefore a description of them will, at this juncture and in view of possible future developments, supply readable matter. A representative of the "Journal" has visited the works; but what he thinks of them it is not opportune to state. Many Continental engineers, however, have also seen them; and although several have been met since, the only criticism that we have heard passed has not been in respect of the efficiency, but as to whether the requirements justify to the full the amount of capital that has been expended upon them. That is a question, we would remind the critics, that time with its register of results alone can answer. Our business for the moment is to describe what exists—the character of the design, with details of the construction.

The description should be prefaced by the statement that the new works are situated on the banks of the Seine; and they have been erected to meet the increase in the consumption of gas in the large area served by the gas-works at Rueil, near Paris. The situation of the works is favourable, admitting as it does of the use of the waterway for the conveyance of coal. Looking ahead, and in view of later developments, the site may be regarded as an ample one, and the methodical arrangement of the buildings is all that can be desired to facilitate the reasonable and economical management of the works, and future extensions of plant.

The Inclined Retort-House.

We will deal first with the retort-house, and, in doing so, will give rather more detail than is found in the paper read by M. Parsy at the recent meeting of the Société Technique du Gaz en France, a translation of which was published in the "Journal" for June 21. The house, it is noticed, is designed to harmonize with the local style of architecture. It is 130 feet long by 60 feet wide, inside dimensions, and about 40 feet to the top of the side walls. The roof is formed of curved built-up girders as principals, from the underside of which to the ground line is about 57 feet. Through the whole length is a louvre ventilating roof, raised some 6½ feet, and providing ample light and ventilation. Except on the louvre, the roof is covered with special tiles.



The Nanterre Retort-House in Course of Construction.

The retort-bench consists of eight arches; each containing nine 20 feet inclined retorts. The horizontal width of the bench is 17 feet; from centre to centre, the beds are about 13 feet; and the span left for each arch is 10 ft. 9 in. The arches are built up of arch bricks, and are set at an angle of 32°. It is learnt that the arches and the division walls are set in finely ground fire-clay and fire-brick dust mixed in suitable proportions, except on the outer face of the end walls, where cement has been preferred on account of the amount of moisture in the brickwork. It should be mentioned that the settings are on the Derval system. The furnaces are on the regenerative principle, and are furnished with every facility for being charged with hot-coke direct from the retorts. There are two round brick chimneys placed outside the retort-house (one on each gable end) on the centre line of the bench; leaving an adequate space for passing in between the chimney and the retort-house end walls. The fire-brick lining inside the chimneys is built right up against the red brickwork, and extends along the bottom to the top of the chimneys. The main flues are placed inside the retort-bench, and, on leaving it, pass through the retort-house walls in a straight line. There is little to be said about the retorts, of which there are 72 in all. The floors of the retorts are curved to a radius of 3 feet; the radius of the crown being 15 inches, which is the depth of the retort throughout. At the charging end, the width is 1 ft. 6 in., increasing to 1 ft. 7 in. for the tapering sides; and at the drawing end, the width is 2 feet, increasing to 2 ft. 2 in.

Regarding the bench-fittings, the mouthpieces are of the self-sealing type, of a section similar to that of the retort; the longitudinal taper of the retort being carried up to the front face of the bottom mouthpiece, so as to facilitate the speedy discharge of the coke. The bottom mouthpieces are supported by cross-ties, but none are used at the charging end. There is nothing special about the ascension, bridge, and dip pipes. The hydraulic mains are arranged one to each arch, and are supported by cast-iron stands, which, in turn, are carried along the usual joist supports. The bench is provided with a foul main of 20 inches internal diameter, running the full length, and formed of thin sheet steel. All the tar produced is taken from the bottom of the foul main by means of connecting-pipes leading to an 8-inch diameter tar-main, which extends the full length of the retort-bench, and turns down at one end into a syphon pot.

Both at the front and back of the bench, there are nine buckstays of heavy section. The cross bracing provided is made up of the usual joists placed at the same angle as the retorts, and tying the front and back buckstays together. The bench is braced longitudinally by means of four buckstays at each end, connected together over the setting by round rods and couplings. There are eight longitudinal tie-rods, each fitted with two coupling-boxes, as well as one spiral spring placed against the end buckstays, to allow for the expansion of the work on being heated up.

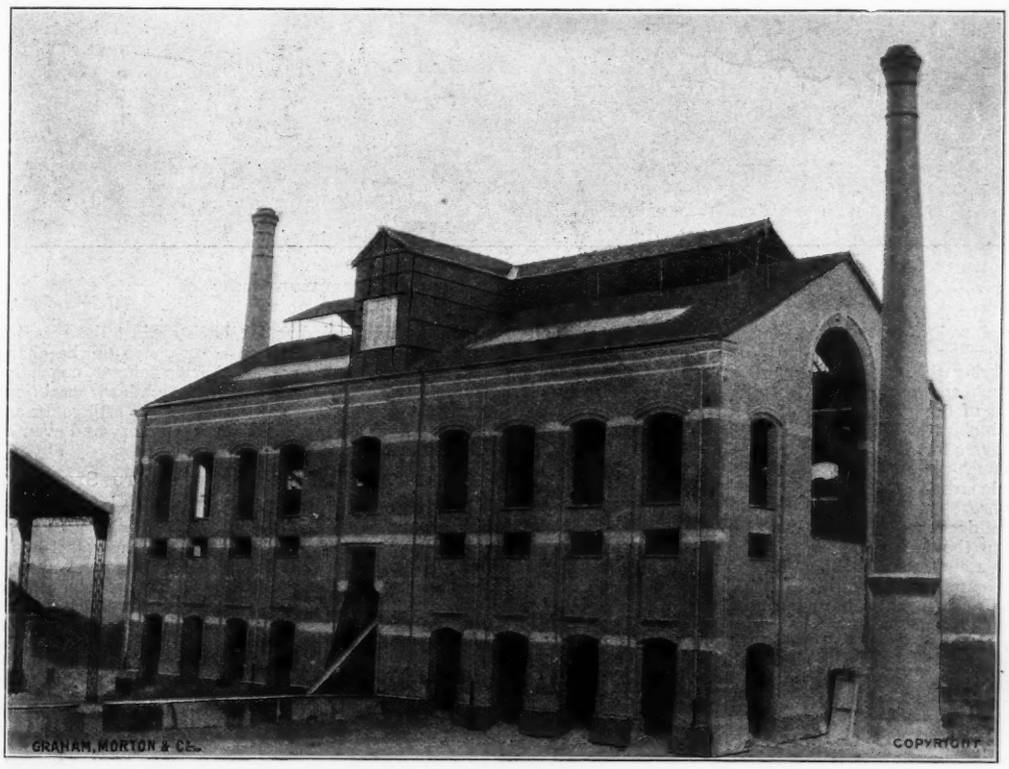
The charging-stage is formed of strong main cross-girders, and is covered with perforated plates, except immediately in front of

the bench. The drawing-stage is 11 ft. 6 in. from the ground-line to the upper side of the flooring. The holes in the retort-house walls which receive the ends of the cross-girders are left amply large for any expansion. Provision has also been made between the retort-bench and the drawing-stage to allow of the coke being discharged from the retorts into the subway underneath in case of need. Staircases give access from the ground-floor of the retort-house to the drawing-stage at each end of the bench; and from the drawing-stage there are also staircases at each end leading up to the charging-stage, and rising further to the gangway over the coal-storage hoppers.

The Coal Plant.

Here it will be convenient (now that we have reached the overhead storage hoppers) to break from the retort-house for the time being, and deal with the coal-storage plant, which is of an extensive and interesting character, handling as it does the coal from boat to retort. The boats are moored at the side of the unloading quay; and a crane and grab deposit their cargoes alternately right and left in hoppers standing over crushers. As the coal is unloaded it is weighed by an automatic weighing apparatus, and its invoiced weight is thereby verified. Underneath each hopper is one four-roll coal-breaker. These breakers are built up of $\frac{1}{2}$-inch wrought-iron side, and $\frac{5}{16}$-inch wrought-iron end plates, firmly bolted together by means of $3\frac{1}{2}$-in. by $3\frac{1}{2}$-in. angle-irons in the corners, and provided complete with massive cast-iron bearings for the crusher-shafts. The breakers are of sufficient capacity for 40 tons of coal per hour; and they reduce it to $1\frac{1}{2}$ inch cube. The structure for supporting the breakers consists of three 8 in. by $3\frac{1}{2}$ in. channels, of about 10 feet long, supported on one cross 8 in. by 6 in. rolled steel joist, which is carried by two 8 in. by 6 in. rolled steel joist pillars. Two wrought-iron jigging screens supply the breakers through two wrought-iron shoots.

The two elevators are 24-inch lattice braced with 44 feet centres; each having a suitable cast-iron boot at the bottom, in which is arranged the gearing for taking up and adjusting the length of the chain. Two strands of chain are provided to each elevator; and at intervals of 18 inches throughout the length of the chain are fastened the buckets and skidder-bars. The runners are provided with renewable greenheart wood liners. The whole of the lattice braced framework is built up of angle-iron runners and stanchions. At the head of each elevator is a wrought-iron shoot for delivering the coal on to the push-plate conveyors for filling the coal-store. The necessary structure for supporting the elevators consists of 8 in. by 5 in. rolled steel joists and cross ties of similar section; the whole being firmly braced. For filling the coal-stores, there are two 24-inch push-plate conveyors, at about 224 ft. 6 in. centres, and running overhead the full length of the stores. For supporting the return chain, an angle-iron framework is built up from the trough, and firmly braced by means of

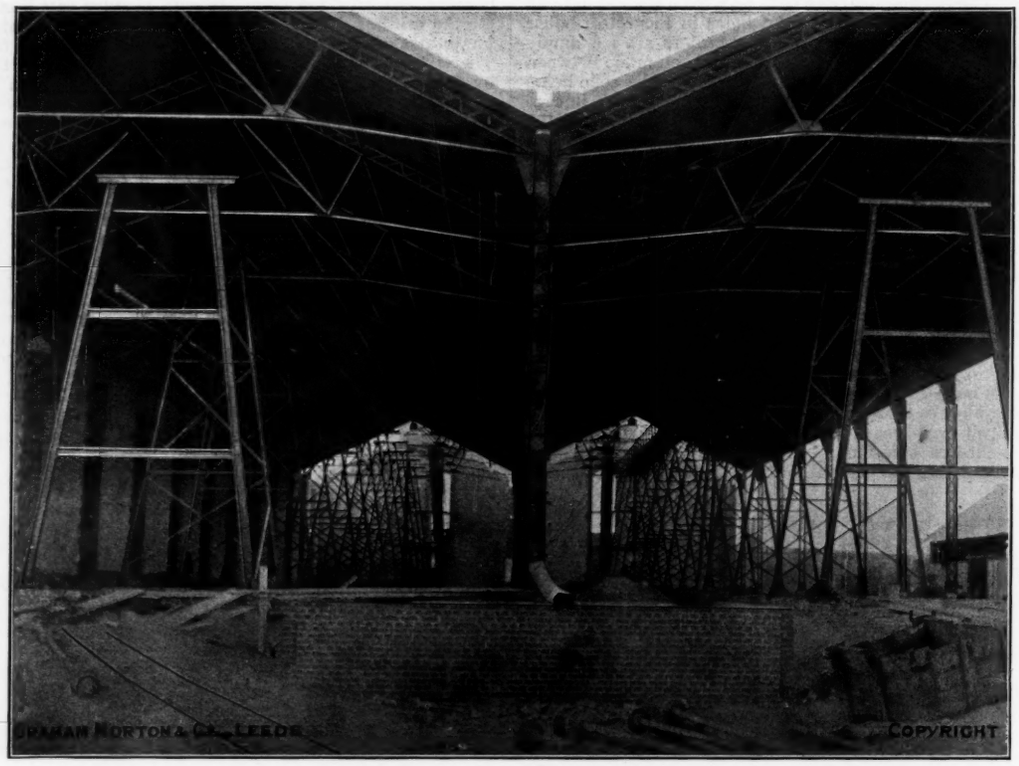


The Retort-House Completed.

flat-bar cross-bracing. Driving and adjusting ends are also provided to these conveyors, with suitable end fittings for engaging with the chains, along which, at intervals of 2 feet, are attached the push-plate and skidder-bars. Twenty-three sets of outlet slides or doors are provided to each conveyor; each slide being fitted with hand-levers and connecting-rods for working them. It was observed that the hand-levers are attached to the handrail pillars, and are easily operated from the gantries alongside the conveyors. Support is given to each conveyor by thirteen wrought-iron trestles, 24 feet high, and pitched about every 18 feet throughout the length of the stores.

For taking the coal out of the stores there are 34 emptying hoppers attached to the floor joists. Each hopper is provided with sliding door and slides, fitted with cast-iron racks and pinions for operating. There are also 34 wrought-iron shoots, 3 feet long; and, for preventing any of the coal from overflowing, the conveyor is provided with 64 $\frac{1}{4}$-inch splash-plates. Running in subways the whole length of the coal-stores, for the purpose of emptying them, are 24-inch steel belt conveyors, with 218 feet centres. Each conveyor is capable of handling 30 tons of coal per hour, and consists of a lattice-braced framework built-up of angle-iron runners and stanchions and flat-bar cross-bracing. The stanchions are arranged at about 6 feet pitch. The sprocket wheels at the ends of the conveyors are mounted on shafts working in pedestals, and fitted with loose collars; and the length of the chain is taken up and adjusted by means of screws. Each conveyor has two strands of chain, and to each pair of links, one on either side, are bolted pressed trays, $\frac{3}{16}$-inch thick, on the top or carrying side. The trays and chains are supported by two cast-iron rollers mounted on shafts working in filbows, and firmly bolted to the angle-iron runners of the framework at 3-inch pitch. The conveyors (which are supported from the bottom of the trench by 6 in. by $2\frac{1}{2}$ in. channels, resting on concrete piers) carry the coal from the stores, and deliver upon a cross steel-belt conveyor, 24 inches wide, and similar in every way to the longitudinal conveyors. It has about 120 feet centres, and is supported in a trench the whole length of its travel. At its delivery end, it deposits the coal into a wrought-iron breeches shoot.

The coal breakers and elevators are driven by two 18 brake horse power gas-engines, giving the required power at 180 revolutions per minute, with gas of about 13-candle power. The engines are of National Gas-Engine Company's make; the cylinders being water-jacketed, and fitted with a loose liner of special hard metal. Either engine is quite capable of driving both sets of plants; so that there is one engine always in reserve. The inside coal-handling plant—that is to say, the push-plate conveyors for filling the stores, and the longitudinal and cross-belt conveyors for emptying them—are driven by two 46 brake horse power gas-engines, capable of developing their powers at a speed of 160 revolutions per minute with gas of 13-candle power, and, like their fellows, each engine is capable of driving the whole of the plant, leaving the second engine in reserve in case of breakdown.



In the Coal-Stores, showing the Overhead Distributing Conveyors.

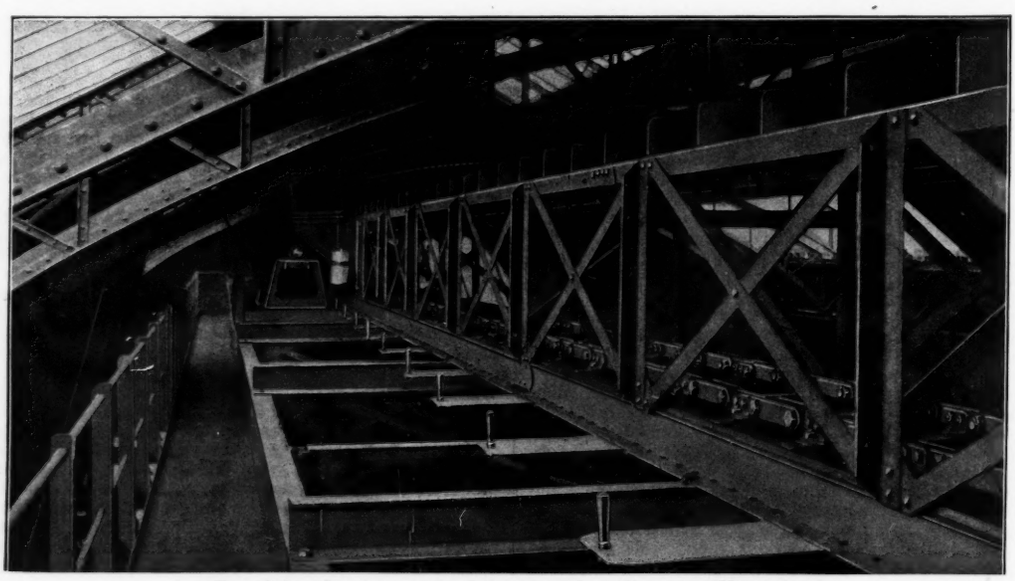
The power of each of these engines is ample for driving not only the whole plant as erected, but for double the plant.

For delivering the coal into the retort-house, there are two elevators, each 20 inches wide, with about 85 feet centres, each the duplicate of the other. They are of the usual form. At the head of each elevator is a wrought-iron breeches shoot, with flat doors and levers for diverting the coal from either elevator into one of two push-plate conveyors. These are 18-inch conveyors, with a double strand of chain (50 feet centres). Each conveyor serves four arches of inclined retorts, and is provided with twelve sets of outlet doors and slides. Underneath the conveyors, and supported on the top of the cross-girders, resting on the back buckstays, is a continous coal-hopper, capable of storing at least twenty-four hours' maximum demand. The hoppers are built up of strong steel plates, and have the usual strengthening framework of steel angles.

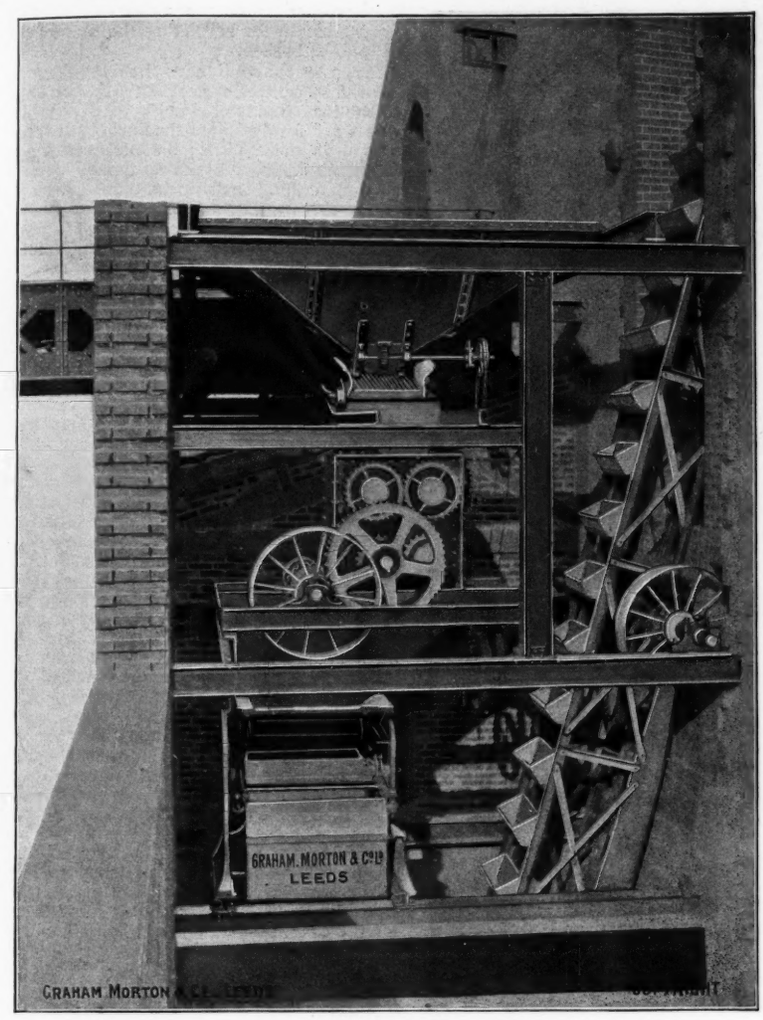
Each vertical tier of retorts is provided with one of Graham's patent measuring chambers and "sure-feed," so as to ensure that the whole of the desired charge will be put into the retort. The usual levers for working the slides of the measuring chambers are supplied, and carried as far back against the retort-house wall as possible, so as to leave a clear space on the charging-stage. There is one complete set of charging-shoots, consisting of three separate travelling shoots—one for each horizontal tier of retorts. They are provided with all the necessary fittings for ensuring the proper fall of the coal, and the satisfactory and even charging of each retort.

An Interesting Coke-Conveyor, with Steam-Exhauster.

In front of the retort-bench, there is one of Graham's patent hot-coke conveyors, which is provided with an exhaust fan for extracting the steam and fumes from the retort-house. When the coke is drawn from the retorts, it is conveyed to one end of the house, and delivered into a primary revolving screen, 3 feet diameter and 15 feet long, where all the breeze passes through the mesh of the screen, and allows the large coke to be delivered by means of a suitable shoot to the coke-breaker. The breeze which passes through this primary screen is sorted into two sizes. All coke breeze under $\frac{3}{8}$-inch cube is collected in a receiving-hopper on the underside of the screen, and from there is taken away by



The Coal Conveyor and Overhead Coal Storage Hoppers.



COAL-BREAKING PLANT AND ELEVATOR.

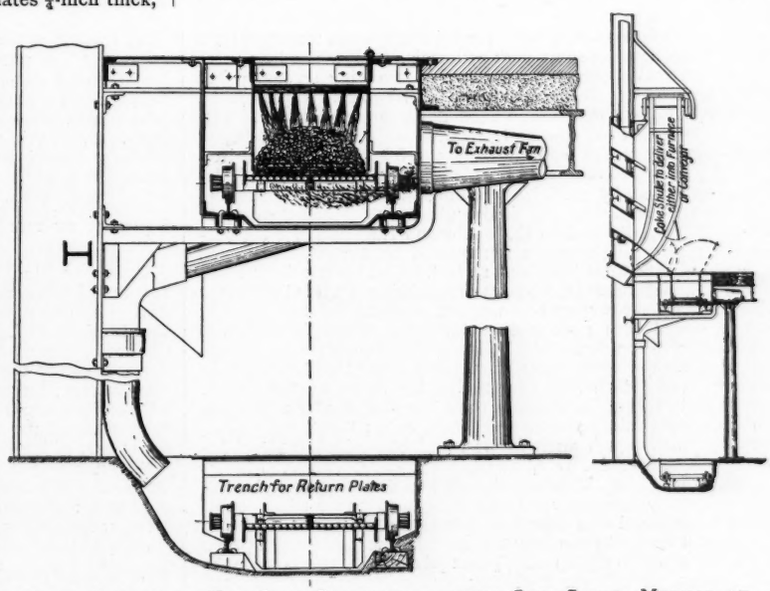
means of skip-waggons. The breeze over ⅜-inch cube, and under 1-inch cube is collected by another receiving-hopper, and is delivered by a suitable bye-pass shoot to the elevator-boot without passing through the crusher. From here the coke is elevated to the main screen by means of an 18-inch cased-in continuous bucket elevator, with buckets specially adapted for elevating the coke. The main screen is 3 feet inside diameter, and 30 feet in length, arranged with four sets of perforated plates ¼-inch thick, and with perforations ⅜-inch, ½-inch, 1-inch, and 2-inch diameter. The large coke passing through the screen is delivered on to a 24-inch steel-belt conveyor for storage into the bunkers or into the yard. Suitable breeches shoots are provided under the screen, so that the screenings can be delivered into the storage-bunkers or on to the plate-belt conveyor for storage in the yard.

The hot-coke conveyor is worth a little more attention. It is 24 inches wide and 120 feet centres to the end drums. The trough is of steel, and in it run a series of steel perforated plates, hinged and bolted together to form a complete endless set of linkwork in itself, the special feature of which is the entire absence of chains. The trough is arranged immediately under the stage-floor, and is built up of ¼ inch side and bottom plates; the latter being dished to form a small secondary trough for the water used in the quenching of the coke, and any breeze that may pass through the perforations of the plates. The trough is supported on 6 in. by 3 in. T-iron brackets, forged to a suitable shape for bolting to the underside of each existing floor-girder at one end, and to the buckstays at the other; both attachments being arranged as angle knees, and stiffened by gusset plates ⅜-inch thick. The dished portion of the trough rests bodily on these bracket supports; but the outer flanged ends are supported on specially prepared blocks, fastened on to the brackets. Through the entire length of the trough, ⅜-inch thick steel chequered cover plates are provided on the top; and hinged doors are arranged in fixed suitable positions so that the coke can be discharged into the conveyor. To prevent the coke falling on the rollers of the conveyor, the trough is fitted with mild steel deflecting plates ⅜-inch thick by 1 ft. 9 in. deep; the latter also ensuring the coke being kept in the centre of the conveyor. Inside the trough, on the upper portions of the dished bottom plate on each side, are fixed the rails on which the rollers of the conveyor travel; the section of the rails being of 2¾ in. by 2 in. bulb T-section, and attached to the trough by ⅝-inch diameter hook-bolts.

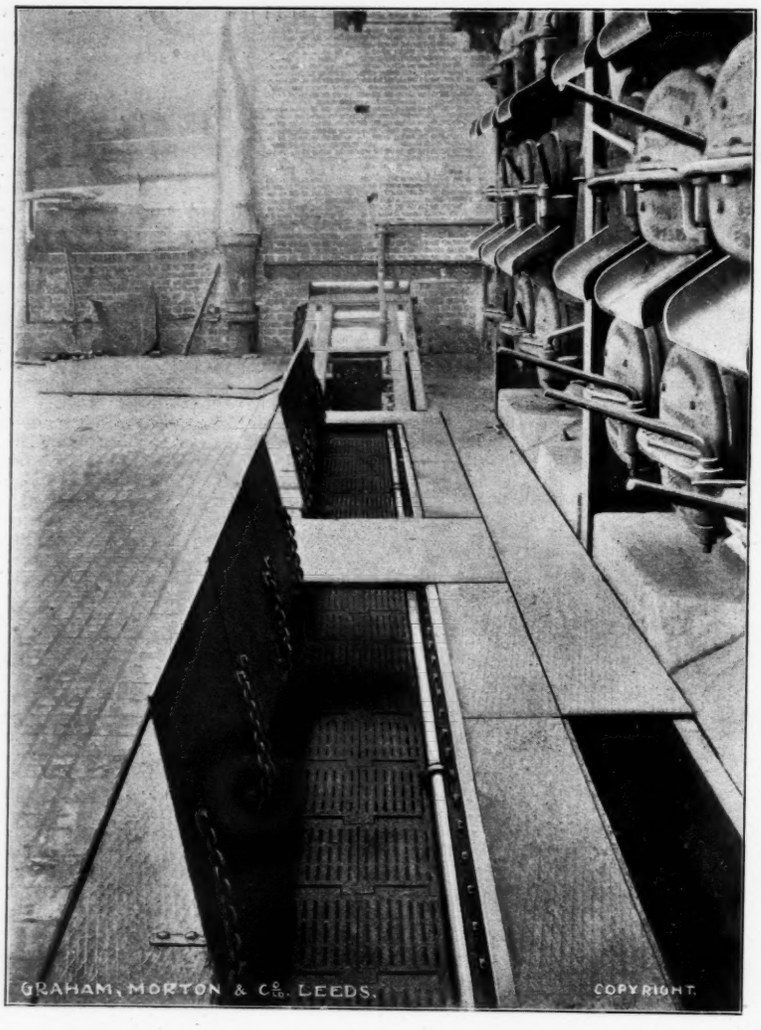
The conveyor or carrier is of plates and linkwork, and of Graham's patent design. It is built up of cast-steel grids of massive construction, 2 feet wide by 1 ft. 6 in. centres of joint pins. Each grid is made in halves bolted together to form one plate, and the joists between the plates are arranged knuckle fashion to form the linkwork. The projecting knuckles on each grid are bushed with $\frac{3}{16}$-inch thick hardened steel bushes, provided with projecting lugs on the bushes, and corresponding recesses in the knuckles to prevent the bushes revolving inside the bosses. Each joint is mounted on 1¼-inch diameter hydraulic tube spindles, 2 ft. 10 in. long, drilled with oil holes for lubricating the joints of the grids. On the outer ends of the spindles are provided (3-inch diameter) steel driving collars and (6-inch diameter by 1¾ inch) tread cast-iron flanged rollers, bushed with white metal. The bosses of all the rollers are secured in position on the tube spindles by loose collars, and are screwed for lubricator caps, which will hold ⅓ lb. of solidified oil or grease; and as the lubricator cap totally encircles the boss of the wheel, the loose collar, and the end of the spindle, it is impossible for any gritty material to get into the working parts, so that, as these are few in number, it forms a commendable feature.

For the purpose of scraping the water and breeze along the dished trough (on the underside of the plates), at pitched distances are placed hinged scrapers or push-plates, which will lie flat on the plates, as the linkwork makes its under or return journey in the bottom trough of the conveyor. The carrying side of the plates are similarly arranged with hinged scrapers, which convey the breeze and water along the bottom trough of the conveyor to a sump.

The breeze and water are discharged from the top trough to the bottom one by means of 6-inch diameter cast-iron pipes. The latter trough or return side of the conveyor is built in concrete below the clinkering-floor level, and rails are fixed to 6 in. by 3 in. timbers built up in the concrete for the conveyor



CROSS SECTION OF HOT COKE CONVEYOR, SHOWING COKE-SHOOT, METHOD OF STEAM EXHAUSTION, &c.



THE NEW HOT COKE CONVEYOR, SHOWING COVERS OVER TROUGH.

rollers to travel on. The trench is covered in by $\frac{3}{8}$-inch steel chequer plates, 3 ft. 7 in. wide, supported on 5 in. by 3 in. T-iron cross bearers, built in the side walls of the trough, as also is the sump at the end of the house under the clinkering-floor.

There are, at one end of the retort-house, two sets of fittings, for adjusting the hot-coke conveyor; the drums being 4 feet pitch diameter, mounted on 4-inch diameter steel shafts, provided with pedestals, loose collars, and adjusting screws. The driving-end fittings consist of two 4-feet diameter cast-steel end drums, with special teeth for engaging with the driving collars, mounted on a 5-inch diameter steel shaft, with pedestals and loose collars.

The plant also comprises a primary revolving screen, 3 feet in diameter and 15 feet long, consisting of two sets of perforated plates with holes $\frac{3}{8}$ inch and 1 inch diameter respectively. The plates are bent to shape, and provided with a 3-inch diameter angle-iron ring at the feed end, and 3 ft. 8 in. diameter cast-iron spur-ring at the driving-end; the plates being lap-jointed and provided with 3 in. by 3 in. by $\frac{3}{8}$ in. angle-iron stiffeners, running the whole length. At the feed end, is one $\frac{1}{4}$-inch dead-plate 1 ft. 9 in. long, attached to the angle-iron ring, and also the perforated plates. This screen is mounted on a $3\frac{1}{2}$-inch diameter steel shaft, of a total length of 15 feet, on which are keyed two $9\frac{1}{2}$-inch diameter cast-iron bosses; each being provided with four $1\frac{1}{2}$-inch diameter wrought-iron arms, screwed on the outside, and provided with $1\frac{1}{2}$-inch diameter nuts. There is a $3\frac{1}{2}$-inch diameter cast-iron thrust-block for the driving-end of the screen, provided with a white metal bush, and a steel pad ($3\frac{1}{2}$ inches diameter and $\frac{3}{4}$ inch thick) for taking the thrust of the screen. On the underside of the screen is a receiving-hopper for any breeze passing through the screen under $\frac{3}{8}$-inch cube; this hopper being provided with 3-inch angle-frames, and one $\frac{3}{8}$-inch plate slide-door working in $2\frac{1}{2}$ in. by $\frac{5}{16}$ in. angle-iron slides with hand-levers for operating them. There is also a revolving hopper under the screen for any breeze over $\frac{3}{8}$-inch cube and under 1-inch cube, which is furnished with 3-inch angle-frames; the screenings being bye-passed direct to the elevator boot by means of one 15-inch diameter shoot built up of $\frac{3}{16}$-inch plate. All the large coke that passes through the revolving screen is delivered into the receiving-hopper over the crusher, by a steel-plate shoot. The coke-crusher is of the usual design, with arrangements for regulating the size of the coke to be broken.

An 18-inch continuous bucket elevator, 56 ft. 6 in. centres, is next noticed. To each of the two strands of 6-inch pitch steel roller chain are firmly bolted the buckets at intervals of 18 inches pitch; the buckets being of Graham's improved built-up type of $\frac{3}{16}$-inch steel plates, and so arranged that the back of one bucket overlaps the front of the following one, and so prevents any dust or grit entering the working parts of the elevator. There is a receiving hopper on the elevator boot, and a $\frac{3}{16}$-inch plate delivery shoot at the elevator-head. And here is found the main revolving screen, 3 feet inside diameter, and of a total length of 30 feet, arranged with four sets of perforated plates, $\frac{1}{4}$ inch thick, with perforations $\frac{3}{8}$ inch, $\frac{1}{2}$ inch, 1 inch, and 2 inches in diameter. The screen is driven by a 3 ft. 8 in. diameter cast-iron spur-ring, firmly bolted to the screen plates; these being further stiffened by four 3-inch diameter T-irons running the whole length of the screen. At the delivery end, is a suitable thrust-block of cast iron with brass bush and steel pad for taking the thrust of the revolving screen. On the underside of the screen are breeches shoots, so arranged that the screenings may be either delivered direct on to the plate-belt conveyor or into the storage-bunker as may be required. Over the storage-bunkers and the yard is a 24-inch steel-belt conveyor, 155 feet centres. It is built up to the usual standard design, consisting of a latticed-braced framework, with 3-inch angle-iron top and bottom runners. Two strands of 12-inch pitch cast-steel chains are supplied to each pair of links, one on either strand, which are firmly bolted to the $\frac{3}{16}$-inch pressed steel plates, one end of which is joggled so as to fit under the preceding plate to prevent any dust or grit falling through the conveyor framework. The conveyor is supported by means of eight wrought-iron built-up trestles 19 ft. 6 in. from the ground-line. For delivering the coke from the conveyor into the yard, there are eight sets of throw-off ploughs. Alongside the conveyor is also a walking gantry.

Another feature of the coke plant is the set of storage-bunkers for the screenings and large coke; the bunkers being 52 feet long by 9 feet wide and 11 feet total depth. They are provided with six sets of outlet doors and slides; the slide doors being $\frac{3}{8}$-inch thick, working in 3-inch angle-iron slides, and provided with the necessary hand-levers for operating them. For delivering the coke into waggons, there are eight shoots. The structure for the storage-bunkers consists of ten 8 in. by 6 in. rolled steel-joist pillars, 13 feet total length. On each side of the bunker are two 10 in. by 6 in. rolled steel-joist runners, 58 ft. 6 in. total length, from which is built up 8 in. by 6 in. rolled steel-joist pillars, supporting the elevator and the revolving-screen.

The whole of the gearing necessary for driving the complete coke plant is provided and driven from duplicate 33 brake horse power gas-engines. On the gas-engine shafts there are keyed 3-feet diameter wrought-iron belt pulleys, fast and loose, which drive the main countershaft by 7-inch wide double leather belts. From this countershaft, the drive to the coke-conveyor, primary revolving-screen, elevator, main revolving-screen, and plate-belt conveyor, is arranged by steel shafts, cast-iron bevel-wheels, sprocket wheels, and chains.

SUMMARY OF THE POINTS FOR THE HOT-COKE CONVEYOR AND STEAM EXHAUSTION.

Before concluding this article on these large and important sections of the new works at Nanterre (the whole of the mechanical part of which was carried out by Messrs. Graham, Morton, and Co., Limited, of Leeds), a few additional words may be said as to the hot-coke conveyor, which is perhaps the newest feature. On the occasion of the visit of the "JOURNAL" representative, it was not working; but report from independent sources since received tells of its smooth and efficient running. The question of the exhaustion of the steam, too, is of great importance; and this forms part of the installation.

Summarizing the features of the new conveyor, the coke falls on to a grating, travelling at a suitable height above the level of the bottom of the trough. As soon as the coke is quenched, the waste water drains through the grid into the lower portion of the trough, and any small material that is washed through falls into the same trough, and is cleared away by the scrapers fixed under the grids—thus leaving the coke perfectly clean and dry. The load can be discharged at the end of the travel into any

elevator or conveyor. The scrapers are fixed to the top and beneath the grids, at intervals of about 12 feet. Those on the under side of the grids hang vertically while travelling along the top trough, scraping any small material that washes through the grating into the outlet-shoots provided either in the side or bottom of the trough, and spaced 24 feet apart. The water is drained through these shoots into the lower trough. The breeze or refuse and water in the lower trough are taken away by scrapers fixed on the top side of the grids, and then discharged into a sump or collecting-tank, which can either be placed inside or outside—at the end of the retort-house or other convenient place. The most appropriate dimensions for the grids are 18-inch centres by 2 feet wide. It follows therefore that the hinges are 18 inches apart. They work on hollow steel spindles mounted on runners or wheels at the joints, or supported at intervals on fixed rollers, or arranged to slide or travel in any convenient manner on continuous bearings. The runners move along a rail—thus reducing friction; and the trail may be internal or external. The runners are fitted with lubricator caps having a spring attachment to prevent the caps leaving the rollers. The recesses in the end wheels for driving serve the special purpose of receiving the collars on the hollow steel spindles. An economic point about the collars is that they can be easily and cheaply replaced.

This brings us to the second important feature. The inside side plates are perforated the whole length of the conveyor; and through these perforations the steam and fumes are extracted by exhaustion or pressure, which may be produced either by chimney draught, blower, exhauster, or fan. The contrast between the state of the working atmosphere in a retort-house under the old condition of things and that under the new condition is described as remarkable.

[Other illustrations accompanied the paper by M. Parsy on the Derval settings at Nanterre, published on the 21st ult., p. 873.]

ANOTHER AIR-GAS SYSTEM.

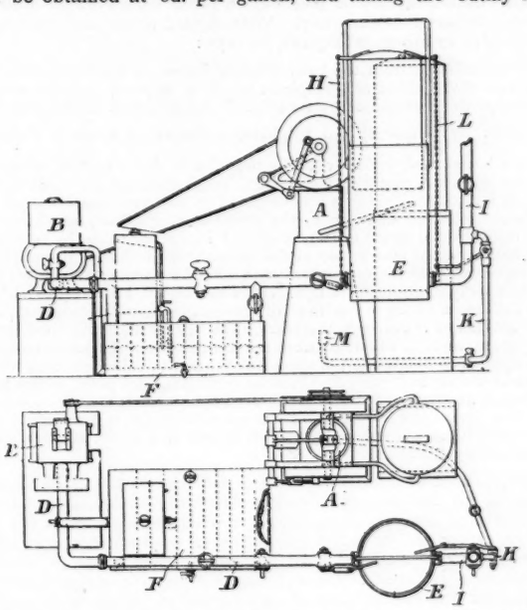
Recent volumes of the "Journal" have contained descriptions of several carburetted air systems, for each of which some special advantages have been claimed in the way of economy and efficiency. In spite, however, of this fact—or because of it—another invention for a similar purpose has lately been introduced on the market. There should, of course, be a considerable demand—at any rate, in places where the ordinary gas-main is not to be found—for an efficient and economical plant of this character; and if all that has been claimed on behalf of the different arrangements that have been introduced is capable of substantiation in practice, the would-be purchaser cannot complain that there is no selection open to him from which to choose an installation suitable to his requirements.

But it is not our intention now to deal in a general way with the question of the manufacture and supply of carburetted air. As already admitted, there are many conditions under which the cheap and reliable production of such a source of light and heat could not fail to be of advantage. This is shown by the number of acetylene gas plants which have been installed throughout the country, notwithstanding the risk which has been proved to attend their use. Granting, therefore, that there is a substantial opening for apparatus of the kind referred to, it is naturally our wish to keep readers informed of the character of the various bidders for public favour. This desire has led us to make some inquiry with regard to the nature of an arrangement which is now being placed upon the market by the Economic Safety Gas Company, Limited, which has been formed with the object of exploiting two patents—one of which deals with the carburetting plant and the other with the burner, which is an essential part of the system.

The accompanying illustration of the producing apparatus (which is taken from the patent specification) will indicate the nature of this part of the invention. It consists of a hot-air engine A, which receives its heat from a burner M fed with the carburetted air through a cock which is in connection by a chain L with the sliding-bell of the gasholder E, so that the supply can be partially shut off when the latter is full. The hot exhaust air from the engine is conveyed by means of a pipe (not shown) underneath the carburettor F, for the purpose of supplying heat to compensate for the loss in temperature by evaporation of the petrol. By this means, the hydrocarbon contained in the carburettor is maintained at a suitable temperature for the efficient carburation of the air passing through it. There is an outlet D from the blower B for conveying the air to the holder. In the arrangement shown, the carburettor is placed in the pipe D, between the blower and holder, though it may be put between the holder and the burners where the vapour is to be consumed. That is to say, the air may be carburetted either before or after it reaches the holder. The carburettor is, of course, so arranged that the air passing through it may take up sufficient vapour. There is a cock in the pipe D, and also one in the bye-pass to the carburettor; so that, by adjusting these, the relative quantities of air which flow respectively through the pipe and the bye-pass can be controlled to regulate the strength of the mixture obtained. The sliding-bell of the holder is in connection by a chain H with another cock upon the pipe D, so as to shut off the flow of air to the holder when the bell reaches its uppermost position. I is the outlet-pipe from the holder to the burners; and K is the pipe which supplies the mixture to the burner M.

From this description, it will be seen that the idea is, by only passing through the carburettor a portion of the air forced by the blower into the holder, to obtain a very dilute mixture, which is non-explosive and non-poisonous. This, of course, necessitates the employment of a special burner for incandescent lighting; and to meet this requirement is the object of the second patent. The burner in question is constructed of a head and stem, both of which are filled with concentric rows of tubes, so as to divide the vapour into a number of streams. The tubes which give the best results are those having an internal diameter of from about $\frac{1}{32}$ to $\frac{3}{32}$ of an inch; and two or more concentric rows are essential in the upper part of the burner in order to produce the desired result. The tubes do not extend to the bottom of the burner-head; a space being left so that the vapour issuing from the stem can spread over the whole of the tubes. A gauze disc may be fixed below the ends of the tubes in the burner-head.

In the course of a report upon the process which was prepared some time ago by Professor Vivian B. Lewes and Dr. Boverton Redwood, they state that to the inventor of this system belongs the credit of having originally recognized the possibility of employing, under suitable conditions, a gaseous mixture containing far less of the hydrocarbon than was previously considered to be necessary, and of having devised a novel form of burner for the purpose—thereby considerably increasing the lighting effect and diminishing the cost. A recent visit to the Company's premises in the City satisfied us as to the excellent illumination obtained by means of the system; but for information upon the all-important point of cost, we must turn again to the report, which states that, assuming the petroleum spirit necessary can be obtained at 8d. per gallon, and taking the outlay for



labour, maintenance, and mantles at 2d., the cost of obtaining a light of 850 candles is almost exactly 1d. On the basis of hydrocarbon consumption alone, a light of 1000 candles is obtainable for somewhere round about 1d. an hour. It may be mentioned that the present wholesale price of petrol is 9d. per gallon. The report bears out the contention that the gas is non-explosive, on account of the small amount (about $1\frac{1}{2}$ per cent.) of hydrocarbon vapour which it is necessary for it to contain; and that there is no reason to fear any loss of illuminating power by passing through an ordinary system of service-pipes in a dwelling-house. It is pointed out that the burner is so constructed that no explosion or flashing-back could occur, even if a larger proportion of hydrocarbon vapour were at any time present in the gaseous mixture; while as the gas contains practically the whole of the air needed for its combustion, little or no oxygen is withdrawn from the room—no air being taken in at the burner.

The whole apparatus is automatic, and produces the exact amount of gas required according to the number of lights in use. The time taken to start the hot-air motor is about one minute; and once started, no further attention is necessary. Very little room is required, as the plant only occupies a few square feet; and—with the use of special burners—the gas is suitable for cooking and heating purposes, as well as for lighting. The burners for lighting are made in different sizes, and for use on the upright or inverted system. Judging by the report of Professor Lewes and Dr. Boverton Redwood, as well as by the brilliancy of the light afforded by the plant we have seen in operation, the Economic Safety Gas Company should secure their share of the business that may be going in this line—especially in view of the fact that the cost of a complete apparatus for forty lights, aggregating 2000 to 2500 candle power (including a set of burners and mantles), is not more than £40.

ANALYSES OF AMMONIACAL LIQUORS.

In the notice of the last annual report of the Chief Inspector under the Alkali Works Regulation Acts (Mr. R. Forbes Carpenter) which appears elsewhere, it is mentioned that the laboratory investigation of ammoniacal liquor from various sources which had been an interesting feature of preceding reports had been accomplished, and that as Mr. Carpenter thought it would be useful to those engaged in the manufacture of ammonia products, as well as instructive to students, if the conclusions finally reached were summarized, he asked his assistant (Mr. S. E. Linder, B.Sc.) to undertake this work. The fruits of his latest labours are given in considerable detail in the report. He deals successively with the testing of free and fixed ammonia, carbonic acid, chloride, and sulphur—the last as sulphate, sulphocyanide, sulphide, sulphite, and as thiosulphate. At the close of his remarks on these matters, he gives a short list of references to the more important papers relating to the subject discussed. He then takes up again the estimation of sulphite in liquors, in connection with which three methods were tried—viz., (1) Differentiation of sulphite and thiosulphate by oxidation with a current of air; (2) precipitation of the sulphite by baryta water; and (3) the polysulphide method. Coming to the estimation of the total sulphur in liquors, Mr. Linder says that to test the accuracy of the bromine oxidation method, the residue left after evaporation of the oxidized liquor to dryness was in one experiment fused with sodium peroxide before extraction with water for precipitation of the sulphate with barium chloride. The total sulphur obtained per 100 c.c. was 0·3261 gramme; and by simple bromine oxidation, 0·3260 gramme. The uniform consistency of the results obtained by this method, he remarks, serves as indirect confirmation of its accuracy. With regard to the distribution of sulphur in ammoniacal liquors, he says:

> If we subtract from the total sulphur found by bromine oxidation the sum of the constituent sulphurs found as sulphate, sulphocyanide, thiosulphate (determined by titration of the acidified filtrate from the sulphide by $\frac{N}{10}$ iodine) and sulphide, a difference figure is obtained which has proved to be invariably negative in sign since the adoption of the improved method of estimating sulphocyanide described in the report for 1902. Evidence was obtained in that year that some of the difference noticed was due to the presence of sulphite, which caused the thiosulphate figure to largely exceed its proper value by reason of the factor for the conversion of the iodine into sulphur as thiosulphate being 0·0064 gramme of sulphur per 1 c.c. of iodine, while that for sulphite is only one-fourth of this. This has failed, however, to reduce the difference figure to the limits of reasonable experimental error; and the conclusion is reached, therefore, that organic matter is the disturbing cause, as such differences are not noticed when the same methods are applied to determine the same constituents in solutions from which organic matter is excluded. Various considerations point to the thiosulphate titration as the one peculiarly liable to such interference; and for this reason the iodine method of estimating this constituent in ammoniacal liquors is finally rejected in favour of a figure arithmetically obtained by difference.

Mr. Linder concludes with a few remarks on the estimation of cyanide in ammoniacal liquor. After the conclusions on the methods of analysis summarized above, occasion arose for the exact estimation of small quantities of hydrocyanic acid often present in a liquor, and a method was devised which is found to yield reliable results. Opportunity has not yet occurred for an extended trial of this method on a variety of liquors from various sources; but it has been sufficiently established to deserve mention. More extended notice is anticipated in the report of the Chief Inspector for the current year.

According to the "Revista Minera," natural gas has been found in Vendsyssei, Jutland, at a depth of 230 feet with a pressure of 7 to 8 atmospheres. The quality is stated to be suitable for lighting, heating, and motive power.

It is pointed out in "Progressive Age" that a few years ago about one-third of the gas companies in the United States had electricity departments; now the proportion has risen to about 45 per cent. Formerly the practice was common for owners of coal-gas plants to put in water-gas auxiliaries; now the tendency is just the other way. It is not very long since gas companies attended strictly to their own business; now they are taking up central station heating, trolley-car systems, and similar public utilities. These remarks are offered to show how the business of gas supply has widened of late years.

Dr. Aspinall Marsden, who has made a special study of the water supplies of Lancashire and Yorkshire, has lately issued a pamphlet in which he urges the necessity for an inquiry being instituted as to how far the public health is injuriously affected by the drinking of smaller doses of lead in water, for a long period, than those which are sufficient to produce extreme symptoms, for these have hitherto often appeared before the grave damage to the health of the general community has been adequately appreciated. Dr. Marsden points out that the cause of the terrible sufferings resulting from arsenic in beer remained undiscovered for a long time; and he is of opinion that the same thing is happening to-day in regard to lead poisoning.

MEETING OF THE BELGIAN GAS ASSOCIATION.

The Annual General Meeting of the Association of Belgian Gas Engineers was held on the 30th ult. at Blankenberghe. It was preceded by a short visit to Bruges, where the sympathetic Gas Manager—the well-known M. De Brouwer, who had courteously put open carriages at the disposition of the members—first took them to visit his show-room and workshops, where they were particularly interested by the incinerating system in use there of mantles for incandescent burners. A glass of champagne and some light refreshments found a place in the kindly treatment of the visitors.

From the show-rooms, the members were driven through the picturesque streets of the old Flemish town to the outlet of the new canal, of which the fore part was to be visited next day at Zeebrugge, and afterwards to the Scheepsdaele Works, which works saw the birth and successful growth of the De Brouwer conveyor, projector, and pusher. After the drive, the Bruges Gas-Works were visited, and the machinery was seen at work.

It is unnecessary at this time of day to describe the simple and ingenious plant and apparatus. Their working and many advantages have been already fully explained; but it is interesting to point out the financial results which M. De Brouwer himself has obtained by their use. By the successive introduction of conveyors, coal projectors, and pushers (although the stokers' wages have been increased from 2·75 frs. to 3·25 frs. per day), the wages per ton of coal were first of all decreased from 2·00 frs. to 1·50 frs.; then to 1·17 frs., to 0·87 fr.; and finally to 0·70 fr. This latter figure will be still further reduced when the regenerator furnaces on the De Brouwer system, with eleven through retorts each, are erected.

During the discharging operations, the relative slow speed of the pusher was remarked, both when ejecting the coke and when the pusher was withdrawn. This was especially noticed by those who were able to compare the speed with that at which the Paris pusher travels, as seen at La Villette works. The speed is evidently limited by the capacity of the conveyor.

After having partaken of an excellent lunch at the Hôtel des Flandres, the members left for Blankenberghe, and visited the gas and electric works of the town. These belong to a Company; the electric station being situated at the gas-works. It was in the spacious engine-room of the electricity works that the meeting took place; and this will assuredly be the first time that a gas meeting has been held in an electric light station.

The Chairman (Mr. Brandt, the Manager of the St. Josse ten Noode Gas Company) opened the proceedings. The Secretary (Mr. Van Heede, the Engineer of the Koekelberg works of the Imperial Continental Gas Association) made a communication as to the financial situation, after which new members were admitted. The meeting then proceeded to the discussion of the technical communications.

M. Laurain, the Engineer of the Société Continentale pour la Fabrication des Compteurs, of Paris, and a member of the Société Technique du Gaz en France, described a new dry meter, named the "Constant," in which a modification in the construction of the measuring chamber is said to prevent inaccuracies in the measurement arising from the folds in the leather. The improvement includes a new way of attaching the leather to the frame, so as to prevent the risk of burning in soldering. In the discussion which followed, MM. Tricot and De Brouwer pointed out the advantage to be derived from testing the results of the new meter with those already in use, and also of testing generally dry meters which had been in position some years. They offered to do this.

M. Asselbergs, the Manager of the Bergen-op-Zoom Works, described a covering, constructed on the Monier system, for tar and ammonia tanks.

The Chairman next requested Mr. Salomons (Manager of the Imperial Continental Gas Association at Brussels), who had just returned from Berlin, to give the meeting some account of what he had seen in Germany, particularly in regard to vertical retorts. Mr. Salomons described what he had seen at Hanover in connection with the new charging and drawing machines there. Respecting the vertical retorts which he has seen working at Berlin, he regretted that only a trial bench was at work. These trials were being made in conjunction with other parties, so that, as the members would understand, it was impossible for him to enter into details. He could only say that the results obtained up to the present were very satisfactory, and gave every hope of success in the future. As was to be expected, the gas produced after eight to nine hours' distillation was somewhat inferior; but, on the other hand, the coke produced was of a superior quality and resembled foundry coke, as could be seen from a sample that he exhibited.

After the meeting an inspection was made of the Gas and Electricity Works, which are managed by M. Busine. The members were much interested in the production of the electric current by means of two very fine 90-horse power gas-engines of the Otto type, and constructed by Fetu et Defize, of Liège. The starting arrangement by means of compressed air was especially admired, acting, as it did, with great ease. With these engines, only 950 litres of gas are required for the production of a kilowatt-hour. The current is delivered at 220 volts.

A banquet took place at the fine Hotel du Kursaal facing the Digue. In the course of the toasts, the President heartily thanked

the hosts of the Association—M. Busine and M. De Brouwer—to whom, he said, they owed so much for the pleasant day passed. He also thanked the Secretary for all he had done during the year. The President also proposed the health of the visitors, including M. Cornuault, a former President of the French Society. The latter ended the series of toasts with a humorous speech, saying how pleased he was to have been chosen to represent his Government for the section of lighting at the Liège Exhibition. As a Frenchman, he felt quite at home at Belgium.

Some twenty members remained at Blankenberghe until the following morning, to take part in an interesting excursion to the new port of Bruges, destined, it is hoped by its inhabitants, to restore to this interesting old town some of its pristine importance.

THE LUCHAIRE-LECOMTE GAS REGULATOR.

By M. Lecomte.

[A Paper read before the Societe Technique du Gaz en France.]

The introduction of a device for regulating the consumption of gas at the burner was due to Boivin, in 1840; but Babton and Giroud improved his original idea. The former devised the tubular valve, to remove (almost completely) the excess of upward pressure; and the latter was the first to construct a tiny regulator with a bell standing on a seal filled with glycerine. The Lecomte bunsen described at the congress of the Society in 1898 was fitted with a dry regulator with an aluminium valve of special construction; and an experience of some 100,000 of these instruments has made prominent their merits as well as defects. The glycerine regulators, though accurate, non-choking, and adjustable to very small consumptions, possess one serious drawback—viz., the glycerine. Under certain circumstances, this evaporates; and in the case of an installation under examination for a considerable time, it was possible to trace the rationale of this evaporation. At the end of a month, sometimes sooner, the regulator leaks. On removing it, drops of glycerine are found in the gas-supply pipe; and if the regulators are unscrewed, more liquid is found than was placed therein. This state of things arises from the condensation which takes place when the burner is extinguished. Tiny drops of water dissolve in the glycerine, and when, after a time, this substance has been diluted up to a certain point, it evaporates, leaving the bell dry.

Dry regulators do not possess this defect; but they have other disadvantages. The aluminium valve in the Lecomte bunsen absorbed 5·25 mm. of water pressure. If the apparatus is to be adjusted to a small consumption, there must be very little play between the valve and the walls of the chamber; but then the least bit of dirt blocks the valve. If, on the other hand, the play is made greater, the regulator is useless for small consumptions. Also variations of volume take place, due to the fact that the valve, if it does not remain in the centre of the cylinder, alters the conditions of flow in consequence of the variation in the coefficient of contraction. Another drawback to the dry valve has been noted by M. Darlu de Roissy. It is that if the gas is not perfectly purified, or if it has taken up dust or moisture, the lower cover of the valve acts like a condenser plate, and the deposited impurities soon choke the instrument.

To be as nearly perfect as possible, the regulator should comply with the following conditions: (1) The consumption should not vary, however the pressure may vary. (2) It should absorb little pressure. (3) It should not get out of order. (4) It should not become blocked. (5) It should be adjustable for small consumptions. In the Luchaire-Lecomte regulator an attempt is made to combine these qualities in one instrument by adopting a new method of construction. The apparatus, shown in section in fig. 1, consists of four parts—the base A, the cover B, the guide-piece C (fixed to the base), and the regulating bell D, in which are an annular valve E and apertures F. The base carries a thread for the gas-supply pipe. The cover has two threads—one (G) screwing directly into the bunsen burner, the other (H) into the ejector of the burner. Constancy of consumption is guaranteed by the annular valve, which permits the pressure to act above and below without the passing of the gas between the edge of the valve and the top of the cover acting on the weight of the bell. As there are apertures in the bell, it is necessary to open the regulator and manipulate it with a tool in order to change the consumption. The guide-piece C is chiefly used to prevent the passage of gas from the lower to the upper part of the bell, and to reduce the pressure of the direct stream of gas at the outlet. The weight of the bell is only 2·2 grammes; its diameter, 24 mm. (0·96 inch), and it takes up 4·8 mm. of pressure; but as the valve is heavy, a force of 2·2 grammes would be required to depress it if it is arrested in its descent by a particle of dust. But, on the other hand, if the obstruction took place at the lower limit of its movement, the gas pressure, for only one centimetre of water pressure, would have to exert a force of 4·5 grammes in order to disengage it. To prevent dust, drops of water or tar, fragments of naphthalene and so forth, from entering the regulator, the gaseous current is broken up by the guide-plate of the valve, on which these substances deposit.

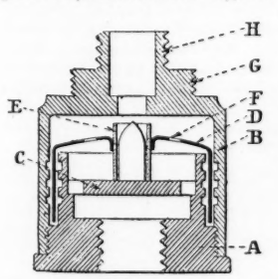


Fig. 1.

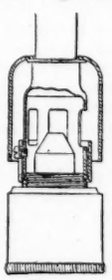


Fig. 2.

The novel part of the regulator consists in the grooves in the interior. As already stated, there must be a small space between the valve and the walls of the regulator in cases of limited consumption. The bell of the Luchaire-Lecomte regulator is placed at the centre of the chamber, with a play of 0·5 mm. for the inside, and the same distance for the outside diameter. To obtain an idea of the size of the passage thus offered to the gas, we may think of the inside play as equivalent to a tube 12 mm. high and 6·7 mm. internal diameter, and of the outside play as of a tube 12 mm. high and 7 mm. internal diameter. And yet through this area only 25 litres (0·88 cubic foot) of gas passes unless the bell is pierced. The gas circulating around the bell should lose pressure equal to the weight of the bell—say, 5 mm. At first the gas passes in thin layers between two extended surfaces—a state of things conducing to loss of pressure. Afterwards, in its passage, it fills each of the grooves, and it will be understood that the temporary halts, the eddies, and other movements involved, almost completely reduce the speed of circulation of the gas, and the whole of it passes by way of the regulating aperture. The current of gas circulating round the bell maintains a constant volume, whatever the pressure as determined by the weight of the bell. The latter is kept central by the pressure of the gas.

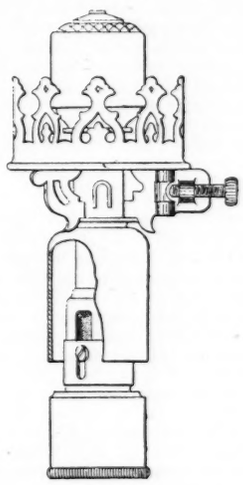


Fig. 3.

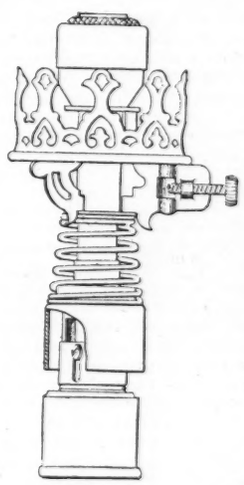


Fig. 4.

As examples of applications of the new regulator may be instanced an ordinary bunsen (fig. 2) which it is desired to keep as short as possible. The extra height of the regulator is only 23 mm. Fig. 3 shows the regulator fitted to a No. 3 Luchaire low-pressure burner working at 25 mm. In fig. 4 the regulator is shown in use on a No. 2 town burner working at 20 mm., and giving a light of 90 decimal candle power for a consumption of 115 litres (4 cubic feet) of gas. The new regulator will also replace that hitherto used in the Lecomte burner, which will thus be able to work (in the No. 2 size) at pressures from 10 mm. The results obtained with a low-pressure bunsen burner in 1898—1 carcel-hour with 11·7 litres at 10 mm. pressure—for which a prize of 500 francs was awarded to the author on the report of M. Vautier, have not yet been surpassed.

The Audit of Municipal Accounts.—It may be remembered that one of the recommendations of the Joint Select Committee on Municipal Trading was that a conference should be held of representatives of the Institute of Chartered Accountants and similar bodies to discuss the question of prescribing a standard form for keeping the accounts of municipal or other local authorities. A few days ago, Sir Gilbert Parker asked the President of the Local Government Board whether any steps had been taken in the direction indicated. Mr. Long replied that he had received communications from some of the bodies mentioned, offering to co-operate in the consideration of the matter; but no conference had taken place. He had, however, been giving attention to the practicability of having a standard form of accounts of local authorities being prescribed, and he was disposed to think that the best course would be to appoint a Departmental Committee to inquire into the system upon which the accounts should be kept.

LIGHT MEASUREMENT.

By Jacques Abady.

[A Lecture delivered before the Dutch Association of Gas Managers.]

By this title, I do not mean the academic investigation of the phenomenon we know as light, but the commercial measuring of illumination from various sources. To the gas-maker—and it is to the gas-maker mainly that these remarks are addressed—the phrase would have meant, until recently, the testing of the candle power of gas; and he would have experienced no difficulty with the type of photometer in his possession. At the present day, however, the practical measure of one method of illumination as compared with another opens out so many different questions, that our old-established practice is no longer useful to us, except in a minor degree; and I have therefore put together the few practical hints for commercial light-testing, which follow.

Thirty years ago, it was not necessary to cut things fine, nor to ascertain with precision the suitability of a particular form of gas lighting, nor to compare it with any other form, because other forms were practically non-existent. Electricity as a light power was only just coming into being; gas was really the only form of lighting available. Now, how different is the situation! Electric lighting, in both its forms, arc and incandescent, nearly drove gas lighting out of being. But the "mantle" saved the situation, and in some countries, at least, threatens to reverse it; for there is no doubt whatever but that gas-mantle lighting is the cheapest in the world. So it follows that incandescent gas lighting has multiplied and now exists in many forms. The recently-introduced inverted lighting threatens to upset our preconceived notions; and they say in Berlin that the "Millennium" has come to stay. But for all this, the competition with electricity and oil is a keen one; and seeing that so many misleading and conflicting statements are often put forward by interested parties, my view is that we should be ready all of us with a knowledge and a system capable of comparing commercially the real, actual value of one light with another, and that such a system, while founded on a proper scientific basis, should be easy of manipulation by those whose many duties prevent tedious and detailed laboratory research.

What is Light?

We all know, or think we know, what light is—how it consists of ether waves vibrating transversely and with varying frequency, which, falling on the retina, create the sensation of sight; how the colour and quality of light vary according to the wave length and frequency, extending at each end of the spectrum beyond our power of sight. It is said that beyond the red end, we have the infra-red, the dark heat waves which are not visible, which create the sensation of heat, which by calorescence can be converted into waves of shorter length, which are light-giving. It is said that beyond the violet end we have the ultra-violet, the actinic, the chemical rays, whose action is utilized in photography, and which can be converted into waves of longer length by fluorescence. We believe, too, that all light-sources emit light which is complex, consisting of waves of different length, and therefore different colour. We also think that what we call colour is that which reflects that particular part of the spectrum and absorbs nearly the whole of the other colours. We know, further, that the white and yellow-white rays are most useful to us for lighting.

All this our text-books tell us; and then they go on to describe how we measure intensity of light, and to define the laws which govern its measuremcnt. These may be summed up, for convenience, as follows:—

(*a*)—Kepler's law: Quantity of light falling on given surface varies inversely as the square of distance from the source.

(*b*)—Lambert's cosine law: Intensity of illumination received obliquely is proportionate to cosine of angle which luminous rays make with the normal to the illuminated surface.

From the above is deduced the formula of the generalized photometrical law, which is that the light on a given surface $= \frac{I \cos \theta}{d^2}$

where I is intensity of illumination source, θ the angle which the rays make with the normal to the illuminated surface, and d the distance from the source to the observed surface.

Text-Book Photometry.

The text-books then describe the well-known photometrical devices, such as the Bunsen grease spot; and we always get the familiar story of how a Royal Personage, on seeing the device, exclaimed: "Now I know the value of a spot of grease." Incidentally it may be mentioned that the personality of the Prince varies with the nationality of the writer; but whether it was a German or an English Prince, we always get the same story. Our books then proceed to inform us that the laws and rules given above only apply to *white* light, and profess the impossibility of measuring lights whose colours are different. One eminent writer says, for instance: "All the preceding figures have reference to white light; but these values are no longer the same if the nature of the light changes." It is at this point that I most respectfully join issue with the scientists, mainly because I have never seen pure white light; and I do not believe anyone else has, except fortuitously. If we accept what our books say, we are led to believe that lights of different colours cannot be compared for a variety of theoretical reasons. It seems to me that the real reason was a very valid one—viz., that with the hitherto known photometrical devices, useful in comparing two lights whose colour was the same (not, as is erroneously stated, *white* lights), it has been impossible to compare lights of different colours, on account, firstly, of the existence of "colour sense," and, secondly, the difficulty of judging equality of intensity when the touchstone of equality—such as the vanishment of a grease spot—could never be reached if the lights were of different tints.

The Solution of the Difficulty.

It is evident, from an examination of attempts made during the last ten or fifteen years, that the want of a differing colour comparison instrument has been badly felt. We must all of us acknowledge the clever and ingenious work of many scientists in the direction of analysis and recomposition of light. But these methods fall rather in the region of the investigation of the phenomenon known as light, and are not suitable for practical or rather commercial, work; and experience has shown those who have studied the matter that none of the spectro-photometers, or optical screens (such as the Weber or Lummer-Brodhun), or polarization, or dispersion, or cosine, photometers enable us to do what we want to—for example, to express the power of an electric arc in terms of a standard candle, or a Hefner lamp, or a carcel, or a pentane standard. It does appear, however, though it may sound egotistical to say so, that a "scintillation" photometer, constructed on the lines laid down by Mr. J. F. Simmance, enables us to do all this, and to measure the intensity of different sources of illumination or different illumination effects in terms of any known standard of light.

The object of this paper is not to discuss the merits or demerits of what is now known as the Simmance-Abady "Flicker" photometer; but it is necessary to refer shortly to one or two points of interest, which can most conveniently be done by quoting from a communication to the Physical Society of London. "A very long experience with all the known variations of 'Flicker' photometers, and the construction of many others of different patterns, resulted in the design of the present instrument, and enabled actual rules to be laid down, which, when adhered to, produce a photometer which is most sensitive to degrees of lights of the same colour, and also enable the intensities of the most violently contrasted tints to be compared and balanced. These rules are as follows: The light effects must be in juxtaposition without any apparent division line, and must move, oscillate, or rotate so that the point of juncture of the rays of the two lights passes and returns entirely across the vision-field. Any hiatus, or longer exhibition of one light than the other, biases the result. The observation surface or surfaces upon which the light rays fall must be at exactly the same distance from the eye, at exactly the same angle in relation to the line of sight, and must be of pure white—such as is afforded, for example, by a clean chalk, plaster of Paris, magnesium carbonate, or barium sulphate. Any tint affects the accuracy of the result. The observation surfaces must also themselves in turn occupy the field of vision. An apparent movement or optical illusion does not afford accurate results."

That these points had never been, nor are now, properly appreciated, is evidenced from the fact that previous attempts which have been made to follow the lines of the Newtonian disc had always been unsuccessful, and that recent attempts founded upon communications made to the Zurich Photometry Congress are just as far from the mark. Now, it is not my purpose to argue—this has been fully gone into in the communication referred to above, and in other articles and publications—whether the effect one gets in using the Simmance-Abady photometer is an indication of intensity or colour sense, or anything else; but the following undoubted facts, tenable from a theoretical point of view, and proved by careful and extended experiment, must just be cited. Let me first point out, however, that the eye is the basis of all photometric operations—the eye is, in fact, the photometer, and apparatus is only necessary to enable us to measure how much one light is greater than the other. Therefore, what we measure on a photometer is the effect upon the eye, and that only. The points to which I refer are as follows:—

(1)—That if two lights of the same tint (as argand gas-flames) are shown to have a certain ratio by a bunsen disc or Lummer-Brodhun screen, the "Flicker" photometer shows the same ratio—*i.e.*, the flicker disappears at the same point on the bar as does the grease spot.

(2)—That if two lights of the same, but another tint (as Welsbach burners) are shown to have a certain ratio by a Bunsen disc or Lummer-Brodhun screen, the "Flicker" photometer shows the same ratio—*i.e.*, the flicker disappears at the same point on the bar as does the grease spot.

(3)—That if, now, the argand is compared with the Welsbach on the "Flicker" photometer, at one point of the bar the flicker vanishes, and it is submitted that it is logical to assume that what was an indication of equal intensity in instances Nos. 1 and 2, is also an indication of equal intensity in instance No. 3.

Illuminant.	Illuminating Power in Hefner Units.	Consumption per Hour.	Consumption per Hefner Unit.	Unit Price.	Cost per 10 Hefner Units.
Coal gas:					Centimes.
Flat-flame burner	16	160 litres	10·00 litres	20 c. per cub. met.	2·00
Argand	32	250 ,,	7·80 ,,	,, ,,	1·56
Incandescent	72	120 ,,	1·70 ,,	,, ,,	0·34
Millennium burner	1400	1200 ,,	0·85 ,,	,, ,,	0·15 0·3
Acetylene:					
Ordinary burner	50	30 ,,	0·60 ,,	1 fr. 56·25 c. ,,	0·94
Incandescent	60	15 ,,	0·25 ,,	,, ,,	0·39
Petroleum:					
Round burner	30	0·08 kilo	2·70 grammes	34·25 c. per kilo.	0·84
Kitson	900	0·33 ,,	0·37 ,,	,, ,,	0·115
Alcohol:					
Incandescent burner	50	0·10 ,,	2·00 ,,	50 c. ,,	1·00
Electricity:					
Arc lamp	500	375 watts	0·75 watts	75 c. per K. W. H.	0·56
Bremer lamp	1000	400 to 600 ,,	0·4 to 0·6 ,,	,, ,,	0·3-0·45
Liliput	130	160 ,,	1·23 ,,	,, ,,	0·92
Nernst	180	218 ,,	1·21 ,,	,, ,,	0·91
Incandescent lamp	16	55 ,,	3·44 ,,	,, ,,	2·57

TABLE I.—*Example of Misleading Results.*

(4)—A long series of tests have shown the "Flicker" photometer to be independent of the Purkinje phenomenon [see "Philosophical Magazine," April, 1904], and it is not necessary for me to recount the experiments and repeat the results obtained.

5.—A colour-blind person, in reading the "Flicker," gets the same reading on the bar as a person of normal vision.

It is in my opinion, beyond the region of argument, that the "Flicker" photometer does indicate the effect of the light on the retina, whatever the colour of the light, and under no circumstances, with any other form of apparatus or any other kind of light, is it possible for us to measure anything else but this. We have, therefore, got a step further; and we are now in possession of the photometer which will enable us to cope with modern conditions and to test commercially the value of any kind of light. The question now is, how to utilize it for our purposes.

Horizontal Testing Criticized.

Now, it is often the custom, in giving a light value to a burner, to give the result of a horizontal test. This method, however, unless we are comparing two burners of the same type and ratio of light distribution (a very unusual occurrence), is quite useless for comparative purposes. For instance, one often sees quoted the fact (it is more often fiction) that an arc lamp gives a light of (say) 1000 candles, and that a certain number of watts produced this light; and therefore if x watts produced y candles, and x watts cost z pence, we could get the cost of the candles in terms of the cost of electrical energy—and surprisingly cheap it sometimes appears to be. But let us examine this matter a little more closely, and we find, of course, that this 1000 candles is only thrown in one limited direction; and if we take the light all round the arc, or, in other words, the "mean spherical intensity," we should only get about (say) 250 candles. Consequently, the cost is four times what has been stated. Of course, figures for cost of incandescent gas lighting are tarred with the same brush; but that is no reason why this erroneous method of comparison should be perpetuated. Apart from the misleading nature of such tests, it is impolitic, from a gas-maker's point of view, to continue using them, because the spherical intensity of an incandescent burner (as we shall presently see) approximates much more nearly to its horizontal light than does an electric arc or glow lamp. What I want to make clear is that a horizontal test for ordinary forms of illumination does not afford a proper comparison either for light or for cost. Strangely enough, an example of this erroneous method of calculation and comparison appears in a recent number of the "Journal für Gasbeleuchtung," in an article giving particulars of lighting in various towns, which particulars are compiled by Herren Barth, Kautny, and Knappich. I quote a list of some of the items cited; and it will be seen that the cost comparisons have been made on the basis of the light emitted in one direction only. Of course, I am not absolutely certain of this; but my experience tells me that this must be so from the figures for illuminating power which are given, which certainly could not have been computed from the "M.S.I." (mean spherical intensity).

You see from this at once, as gas-makers, how, apparently, the arc lamp is found to give a light of 10 Hefner units for 0·3 centime. As a matter of fact, it is probably more like 1·3 centime if the computation had been made properly. Again, the figure for the incandescent burner is 72 Hefner units, and the cost 0·34 centimes per 10 Hefner units. Well, now, in this instance you will quite see that this cost ought really to be increased very little, because, as you will observe from the example I have given you, the mean spherical intensity, or the light emitted in all directions, of the incandescent burner is very much nearer the figure cited than is the alleged candle power of the arc lamp. I simply mention these figures as an apposite example of what I mean.

"Mean Spherical Intensity" Defined.

Now what is meant by "mean spherical intensity"? It is a difficult thing to define, but, I hope, an easy thing to explain. The definition is: The sum of the illuminations received by a sphere of radius, concentric with the light source, divided by the surface of the sphere. In other words, it is the intensity of the light source rendered uniform, emitting light of constant intensity in all directions. The explanation is: Suppose we take a light and measure the candle power at different angles from 90° north to 90° south, taking the figure for each angle as being the mean of a number of readings of the light in different positions when moved axially. If we draw to scale these candle powers along the lines of the different angles and then join the extremities, we have a figure perhaps like this.

This figure has a certain area and peripheral dimension. What size true circle would represent the same area and surface? To use a homely illustration, suppose the figure shown is a battered bicycle wheel. If it were pulled out and pushed in, and "trued up," what would be the diameter and rim surface of it? When we clearly grasp this, we have grasped the fact that when trued up, the circle represents a section of a sphere taken through its centre, and the mean spherical intensity is the amount of light that is thrown on any portion of its internal surface by a light placed in its true centre. I hope this makes clear what "mean spherical intensity" is.

FIG. 1.

Before we consider how to express it, we have to obtain the readings of candle power at the different angles, and, as you see, the Simmance-Abady photometer is arranged to attain this object. I shall assume that you all know how to do this—that you are aware that the angles which the standard and compared lights make with the normal to the illuminated surface must in all cases be equalized, that it is necessary to either have a variable secondary standard or a moving primary standard, and that, in fact, you are all familiar with what has been done in this direction. It may be, by the by, that some of you, who have done angle testing, have obtained the readings at different angles by one of the familiar mirror devices. I do not agree with this method (and it is not my present purpose to discuss why); but even though you do, it does not affect the computation or expression of "mean spherical intensity," nor the necessity for the use of a "Flicker" photometer. There are two ways of expressing spherical intensity—one graphically, the other numerically.

How to Express "M.S.I."

First, as to the graphic form of expression. Figs. 2, 3, 4, 5, 6, and 7 (pp. 110 and 111) show the curve of six different sets of tests set out graphically. The left-hand of each figure shows the true spherical curve; the right-hand of each figure shows what is, in my opinion, a more graphic curve—a sort of Mercator's projection. The latter is, I think, very much more easy to grasp. I recommend the use of these charts (to be kept prepared before a test), and both the curves can be plotted out in a few minutes when the readings have been obtained. The angle lines on the charts will, of course, be drawn according to the angles used in testing. Those shown are 90° north, 67½° north, 45° north, 22½° north, horizontal, 22½° south, 45° south, 67½° south, 90° south. It follows that the greater the number of angles taken, the more complete the test.

As to the tests which these charts illustrate, No. 2 is a nominal 500-candle power arc lamp; No. 3 a "C" Welsbach burner with Jena chimney; No. 4 the same with a "squat" opal top, clear bottom, globe (a downward reflecting globe as will be seen); No. 5 the same with an opal round globe; No. 6 the same with

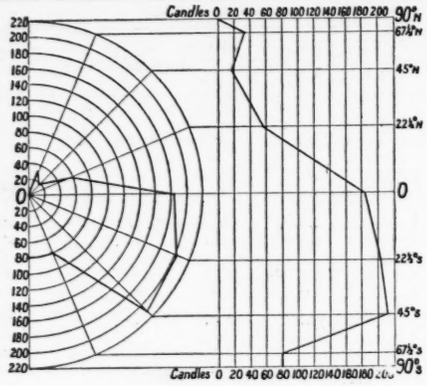


FIG. 2.

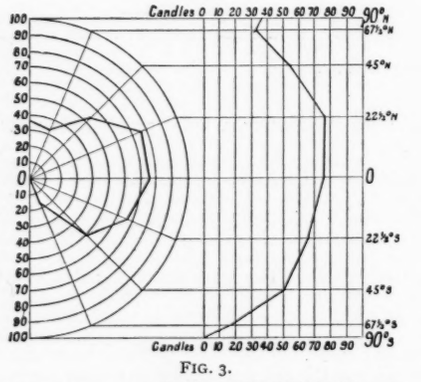


FIG. 3.

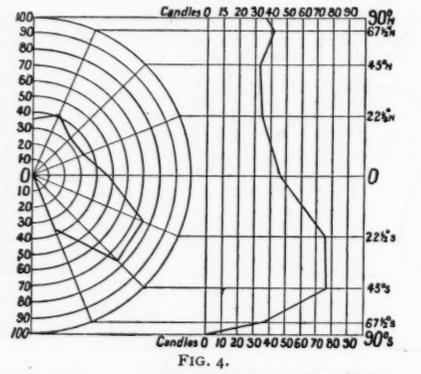


FIG. 4.

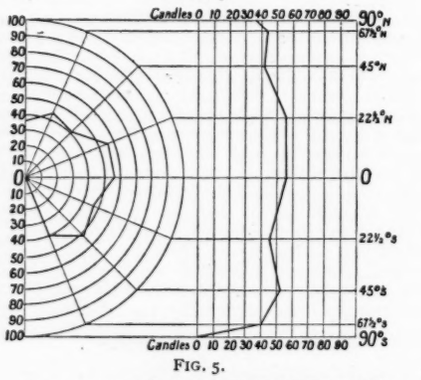


FIG. 5.

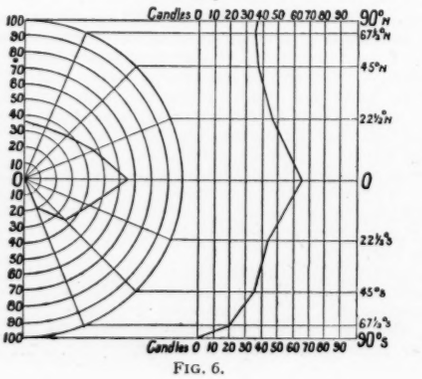


FIG. 6.

Longitudes.	Readings—Candle Power.					Factor for Area.	Mean Readings × Factor.
	0°.	90°.	180°.	270°.	Mean.		
90° N.	0	0	0	0	0	0·01	0·00
67½° N.	25	23	61	23	33	0·075	2·475
45° N.	13	16	28	19	19	0·14	2·66
22½° N.	35	56	83	58	58	0·18	10·44
Horizontal.	105	129	352	150	184	0·19	34·96
22½° S.	112	148	380	172	203	0·18	28·42
45° S.	121	151	402	170	211	0·14	29·54
67½° S.	66	63	123	68	80	0·075	6·00
90° S.	80	80	80	80	80	0·01	0·80
					Mean spherical intensity . .		115·295

TABLE II.—*Mean Spherical Intensity of Enclosed Electric Arc Lamp* (500 *C.P. Nominal*).

Longitudes.	Readings—Candle Power.					Factor for Area.	Mean Readings × Factor
	0°.	90°.	180°.	270°.	Mean.		
90° N.	37·0	37·0	37·0	37·0	37 0	0.01	0·37
67½° N.	32·0	33·0	34·0	33.0	33·0	0·075	2·475
45° N.	54·0	53·5	54·5	54·0	54·0	0·14	7·56
22½° N.	75·0	76·5	78·6	77·5	76·9	0·18	13·842
Horizontal.	75·0	76·5	79·0	77·5	77·0	0·19	14·63
22½° S.	65·5	66·0	68·9	66·4	66·7	0·18	12·006
45° S.	49·0	50·0	52·8	51·0	50·7	0·14	7 098
67½° S.	16·0	17 0	18·6	18·0	17·4	0·075	1·305
90° S.	0·0	0·0	0·0	0·0	0·0	0 01	0·0
					Mean spherical intensity . .		59·286

TABLE III.—*Mean Spherical Intensity of Welsbach "C" Burner with Jena Chimney.*

Longitudes.	Readings—Candle Power.					Factor for Area.	Mean Reading × Factor.
	0°	90°	180°	270°	Mean.		
90° N.					37·0	0·01	0·37
67½° N.					41·0	0·075	3·075
45° N.	Diffusing Globe. Only				33·0	0·14	4·62
22½° N.					34·5	0·18	6·21
Horizontal.	one reading taken for				47·0	0·19	8·93
22½° S.					75·0	0·18	13·50
45° S.	each angle.				76·0	0·14	10·64
67½° S.					37·0	0·075	2·775
90° S.					0·0	0·01	0·0
					Mean spherical intensity . .		50·12

TABLE IV.—*Mean Spherical Intensity of Welsbach Burner with "Squat" Globe.*

Longitudes.	Readings - Candle Power.					Factor for Area.	Mean Readings × Factor.
	0°	90°	180°	270°	Mean.		
90° N.					37·0	0·01	0·37
67½° N.					43·5	0·075	3·262
45° N.	Diffusing Globe. Only				41·5	0·14	5·81
22½° N.					56·0	0·18	10·08
Horizontal.	one reading taken for				57·0	0·19	10·83
22½° S.					46·0	0·18	8·28
45° S.	each angle.				52·0	0·14	7·28
67½° S.					40·0	0·075	3·00
60° S.					0·0	0·01	0·00
					Mean spherical intensity . .		48·912

TABLE V.—*Mean Spherical Intensity of Welsbach Burner with Plain Opal Globe.*

Longitudes.	Readings—Candle Power.					Factor for Area.	Mean Readings × Factor.
	0°	90°	180°	270°	Mean.		
90° N.	37·0	37·0	37·0	37·0	37·0	0·01	0·37
67½° N.	35·0	35·5	38·0	35·5	36·0	0·075	2·70
45° N.	36·5	38·0	40·0	39·5	38·5	0·14	5·39
22½° N.	46·5	47 5	48·5	47·5	47·5	0·18	8·46
Horizontal.	65·0	65·0	65·0	65·0	65·0	0·19	12·35
22½° N.	44·0	44·0	44·0	44·0	44·0	0·18	7·92
45° N.	34·0	36·5	35·0	35·5	36·0	0·14	5·04
67½° N.	18·0	21·0	21·0	20·0	20·0	0·075	1·50
90° N.	0·0	0·0	0·0	0·0	0·0	0·01	0·00
					Mean spherical intensity . .		43·73

TABLE VI.—*Mean Spherical Intensity of Welsbach Burner with Iced Globe (White).*

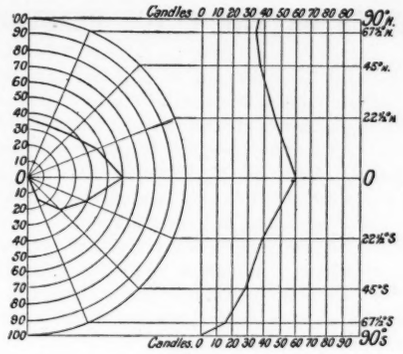


FIG. 7.

Longitudes.	Readings—Candle Power.					Factor for Area	Mean Readings × Factor.
	0°	90°	180°	270°	Mean.		
90° N.	37·0	37·0	37·0	37·0	37·0	0·01	0·37
67½° N.	34·0	35·0	37·0	34·0	35·0	0·075	2·625
45° N.	38·5	38·5	39·0	38·0	38·5	0·14	5·39
22½° N.	47·0	47·0	47·0	47·0	47·0	0·18	8·46
Horizontal.	60·0	60·0	60·0	60·0	60·0	0·19	11·40
22½° S.	39·0	39·0	39·0	39·0	39·0	0·18	7·02
45° S.	27·5	29·5	31·0	28·0	29 0	0·14	4·06
67½° S.	13 5	14·4	17·0	16·3	15·3	0·075	1·125
90° S.	0·0	0·0	0·0	0·0	0 0	0 01	0·0
					Mean spherical intensity . .		40·45

TABLE VII.—*Mean Spherical Intensity of Welsbach Burner with Iced Globe (Pink).*

one of the familiar iced globes; No. 7 the same with one of the familiar pink-tinted iced globes. I only put these charts before you as an illustration of the method of testing; but, incidentally, you will get an idea as to the proportion of light distribution and the extent to which the light is diminished by the use of globes, particularly by the use of pink globes, which are used so often for the production of what is known as a "soft" light.

I trust these charts and short explanation make the graphic illustration of spherical intensity clear to you. The next, and final, point to consider is how to express it "numerically."

Now the ordinary method of affecting this is expressed by the following:—

$$\frac{\int_{-\frac{\pi}{2}}^{+\frac{\pi}{2}} 2\pi I \cos\theta \, d\theta}{4\pi}$$

and the integration cannot be performed directly; so that it has to be got at by approximation. It is, however, a difficult and lengthy process, and can be put outside the range of practicability for the every-day worker in commercial light testing. It is necessary, therefore, to find an alternative and sufficiently exact method; and what I recommend is, I hope, explained clearly by what follows.

If we look at fig. 8, we see a diagram of a sphere. The centre is supposed to be the light, the dotted lines the angles at which tests were made, and the horizontal lines enclose imaginary bands or sections of the sphere the internal concave surface of which has been illuminated, each band, or section, or area, by the candle power found for the angle the line of which falls inside it. You can see from this that if we added together the candle powers for each angle, and divided by the number of points taken, it would not give us the correct spherical intensity, because the light thrown on the area at the 90° north, for instance, would be assigned an equal integral value to that thrown at say 22½°; whereas, as a matter of fact, there is a very much larger surface of our imaginary sphere illuminated by the 22½° light than the 90° north light. What we do, then, is to find the proportion of the surface by which each band is surrounded, or, in other words, the area of the zone illuminated in respect to each angle, reckoning the total surface of the sphere as 1, and then multiply each reading by this proportional factor. The total is then the "mean spherical intensity." The factors for the angles shown in fig. 8 are those used in Tables III., IV., V., VI., and VII.

Let me illustrate this by reference to the test shown graphically in fig. 2. The figures found (as will be seen) are—

Angle.	Candles.	Angle.	Candles.
90° North	0	22½° South	203
67½° ,,	33	45° ,,	211
45° ,,	19	67½° ,,	80
22½° ,,	58	90° ,,	80
Horizontal	184		

Now, if we simply add these up and average them, the figure given is 96·5. This, of course, is incorrect, for the reason stated above. The proper method is shown in Table II., and you will further observe that Table II. expresses numerically what fig. 2

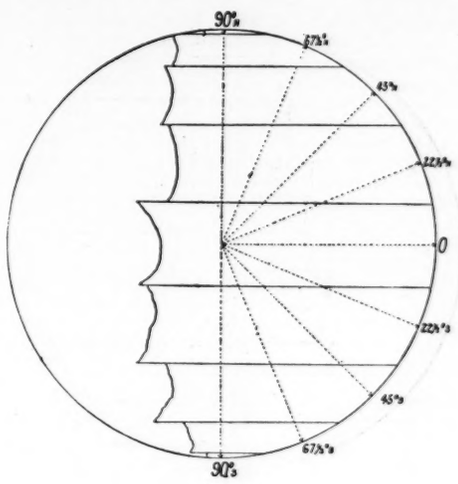


FIG. 8.

—	True Mean Spherical Intensity.	Result of Tests if Simply Averaged.
Arc lamp	115·295	96·5
Welsbach with chimney	59 286	45·8
Do. with squat globe	50·12	42·3
Do. with opal globe	48·912	41·4
Do. with iced globe (white) . . .	43·73	36·0
Do. with iced globe (pink) . . .	40·45	33·42

TABLE VIII. *showing Difference between the True Method and Simple Averaging in Calculating the Mean Spherical Intensity.*

does graphically, and that Tables III., IV., V., VI., and VII. do the same for figs. 3, 4, 5, 6, and 7. In Table VIII., I set out the differences between computing the candle power by averages, and by the method I recommend. You see at once how great is the error introduced by the former method.

You will also see what a splendid spherical intensity one obtains from an ordinary Welsbach gas-burner—a light of just upon 60 candles in all directions must be looked upon as a very good result from the consumption of 3·7 cubic feet of gas, which was the quantity used in the tests set forth. It may be said, "Why set out results graphically as well as numerically?" The answer

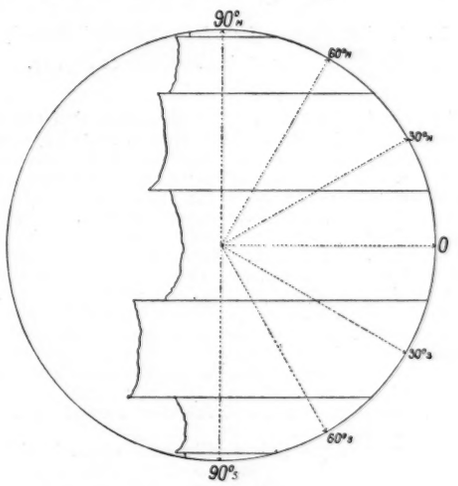


FIG. 9.

Longitudes.	Readings—Candle Power.					Factor for Area.	Mean Readings × Factor.
	0°.	90°.	180°.	270°.	Mean.		
90° N.						0·017	
60° N.						0·13	
30° N.						0·223	
Horizontal.						0·26	
30° S.						0·223	
60° S.						0·13	
90° S.						0·017	
					Mean spherical intensity.		

TABLE IX. *showing Factors for Mean Spherical Intensity when Readings are Taken at Angles Shown in Fig. 9.*

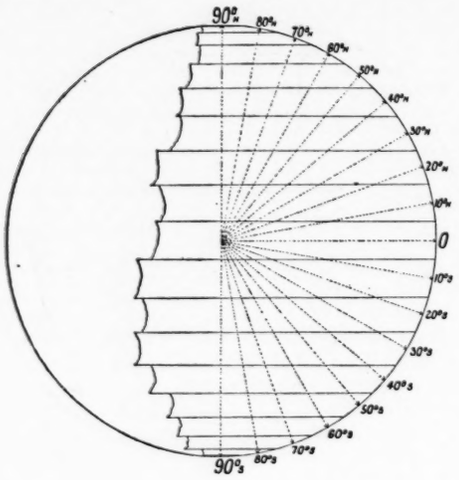


FIG. 10.

Longitudes.	Readings—Candle Power.					Factor for Area.	Mean Reading × Factor.
	0°	90°	180°	270°	Mean.		
90° N.						0·0015	
80° N.						0·014	
70° N.						0·03	
60° N.						0·045	
50° N.						0·056	
40° N.						0·069	
30° N.						0·075	
20° N.						0·083	
10° N.						0·084	
Horizontal.						0·085	
10° S.						0·084	
20° S.						0·083	
30° S.						0·075	
40° S.						0·069	
50° S.						0·056	
60° S.						0·045	
70° S.						0·03	
80° S.						0·014	
90° S.						0·0015	

Mean spherical intensity.

TABLE X. *showing Factors for Mean Spherical Intensity when Readings are Taken at Angles Shown in Fig.* 10.

is that the graphic chart shows how the distribution alters; and it is only practical utilization of this kind of knowledge that can guide us as to the choice of a suitable form of illumination for a given purpose. All the preceding charts and tables have assumed that tests have been made only at the angles mentioned; and the factors given are on the basis of this assumption. It may, however, be required to take either fewer angles or to take tests at shorter intervals. I have, therefore, calculated the factors for these altered circumstances, and show, in figs. 9 and 10, two circles—one divided every 30°, and the other every 10°. The factors themselves are set out in Tables IX. and X.; and I suggest that forms on either of the three models included in this paper should be kept ready printed for use when tests are made. It will be observed that in these forms provisions are made for tests at more than one longitude. The four cardinal points are sufficient for most purposes, and therefore these longitudes are provided for in the forms.

There are many other points of interest which I might have detailed; but I have preferred to lay down a few rules in a succinct manner in the hope that they may help towards a uniform and correct method of expressing candle powers of various sources of light. If the suggestions are adopted, we should be a considerable step nearer a uniform candle unit. For example, there is no reason when we have arrived at a stage when we all take spherical intensities in the same way, why, by the use of the generalized photometrical law $\left(\frac{\text{Intensity}}{\text{Distance}^2}\right)$, we should not, imagining a circle of a given radius—say, 1 metre—express results in candles per spherical metre. Then the mere expression of a simple figure would be the guide to the degree of efficiency of any illumination. I would suggest as a sort of international compromise, 1 metre radius and 1 English candle as a standard; for I do not think there is a more certain unit than an English standard candle measured by a pentane unit or 10-unit lamp.

I trust the figures and tables given herewith, for the lines of which I in no way claim originality, may hasten the desired end, and that the system I recommend may commend itself to you as being logical, simple, accurate, and necessary.

STUDIES ON THE CLAUS REACTION.

In the "JOURNAL" for the 12th of May last year, we gave a portion of a long communication on the above subject submitted to the Liverpool Section of the Society of Chemical Industry by Mr. R. FORBES CARPENTER, the Chief Inspector under the Alkali Works Regulation Acts, and Mr. LINDER, B.Sc., his Assistant. They have lately presented to the Section the results of their further investigations; and these are contained in a long paper published in the current number of the "Journal" of the Society. They bore specially on the question of the loss of sulphur, and were based on the examination of inlet and outlet gases. We can only indicate the scope of the first portion of the paper; but we give the latter part practically in full.

After a few introductory remarks, the authors proceed to determine the efficiency of the Claus kiln and sulphur chamber, and give a number of calculations in regard to this plant in gas liquor works and in those in which the Chance process is used. These are succeeded by the following

DESCRIPTION OF CLAUS PLANTS TESTED IN VARIOUS WORKS.

Works A [*Leicester Corporation*].

Gas Liquor.—1514 gallons per hour of average strength and composition, as shown below.

Air Supply.—The necessary pressure for supplying the kiln is obtained by allowing water from the tubular cooler to fall down one limb of a ∩-shaped pipe; air being sucked in through a hole at the bend and delivered by the falling water into a box provided with blow-off cock and feed valve. Great regularity of feed is secured by this simple means.

Reacting Mixture.—Air and gas mix in an iron box before admission to the kiln.

Claus Kiln.—Dimensions: 7 ft. 7 in. internal diameter with 4 feet of contact material graded in 6-inch layers from the bottom upwards as follows; the figures in brackets being the inches cube:—

6 in. iron oxide (4)
6 ,, fire-brick (3) — Total depth of iron oxide = 3 feet.
6 ,, iron-oxide (2¼) — Total depth of fire-brick = 1 foot.
6 ,, ,, (2)
6 ,, fire-brick (1¼)
6 ,, oxide (1¼)
6 ,, ,, (1)
6 ,, ,, (¾) with two bucketfuls of fine oxide to finish.
Area of contact material = 45 square feet superficies.
Volume ,, ,, = 180 cubic feet.

Sulphur-Chambers.—Hot end (built separately), 12 feet wide, 14 feet long, and 11 feet high (outside). Volume = 1310 cubic feet (approximate).

Cold End.—12 feet wide, 65½ feet long, and 11 feet high (outside). Volume, 6720 cubic feet (approximate); total volume, 8030 cubic feet; and chamber space, cubic feet per cubic foot of exit gases per minute, (15·6° C., 760 mm.), 8030 ÷ 46·41 = 173 cubic feet.

Exit Gases.—To two limestone towers in sequence, each 5 feet square (inside) and 15 feet high; thence to one of two oxide purifiers, in alternate use, with hydraulic valve.

Gas pressure was positive throughout the plant, varying from 3-10ths of an inch water at the inlet to the kiln, to 1-10th water at the limestone towers.

Works B [*Old Kent Road Station of the South Metropolitan Gas Company*].

(One unit of plant tested.)

Gas Liquor.—750 gallons per hour (approximate) of average strength and composition, as shown below.

Air Supply.—From a Donkin's exhauster, which maintains a pressure of about 30 inches of water in the air-vessel (8 feet diameter and 6 ft. 4 in. high), from which the kiln is fed by a 6-inch pipe. The delivery end of the air-pipe is surrounded by that supplying saturator gas on the blow-pipe principle. The air and gas thus discharge together, in intimate contact, into a brick chamber (6 ft. 10 in. by 22 in. high at the centre) placed below the contact material; the reacting mixture passing upwards through the brick packing, and leaving the kiln near the top of one side.

Kiln.—Dimensions: 8 feet internal diameter, with 2 ft. 9 in. depth of fire-brick packing measured from the surface to the centre of the chamber arch. Area of contact material, 50·3 square feet superficies; volume (corrected for curvature of arch), 156·9 cubic feet.

Sulphur-Chamber.—10 ft. 3 in. wide and 10 feet high, 39 ft. 3 in. long (outside), divided into ten compartments by 9-inch baffle-walls. Volume, 2920 cubic feet (approximate); chamber space, cubic feet per cubic foot of exit gases per minute, (15·6° C., 760 mm.), 2920 ÷ 35·58 = 82 cubic feet (approximate).

Exit Gases.—To limestone tower 4 feet diameter and 26 feet high (outside); thence to oxide purifier, 20 ft. by 22 ft. by 3 ft. oxide (inside).

Gas pressure had a slight positive value throughout the plant.

Works C [Redheugh].

Gas Liquor.—1667 gallons per hour.

Kiln.—Internal diameter, 6 ft. 9 in.; depth of packing, 3 feet.

Contact Material.—Oxide of iron. Volume, 107·3 cubic feet; area, 35·78 square feet.

Works D [Granton].

Gas Liquor.—1867 gallons per hour.

Kiln.—Cross section an annulus; large diameter 17 feet, smaller 5 feet (inside measurements); depth of packing, 2 ft. 6 in.

Contact Material.—2 feet of oxide of iron, 6 inches of Weldon mud. Volume, 517·5 cubic feet; area, 207 square feet.

Ammonia in Recovered Sulphur from Claus Kilns attached to Gas-Liquor Processes.

It is a well-established fact that ammonium salts are found in some sulphur-chambers attached to Claus kilns taking saturator gases. Samples of recovered sulphur are occasionally picked out containing a high percentage of ammonia; while at one works the amount has been such as to pay for its recovery by washing, having regard to the destructive action of ammonia on the nitrous compounds used in sulphuric acid manufacture. Moreover, tubes employed for sampling the exit gases from the kiln frequently become blocked with a white deposit, which proves upon analysis to contain sulphite and sulphate of ammonia in notable amount. Analysis of a few samples of sulphur from Claus kilns and Chance process kilns are given in the following table (the figures being per 100 parts).

Gas Liquor used at	Ammonia.				Carbonic Acid.		Sulphuretted Hydrogen.		Total Acids. (B + C); H.E.	Difference of Acids (B + C − A); H.E.	Difference of Acids (B + C − A) NH_3. H.E. = 100.	Per Cent. of Total Acids as H_2S.
	Total, per 100 c.c.	Fixed, per 100 c.c.	Free.		Per 100 c.c.	B. H.E.	Per 100 c.c.	C. H.E.				
			Per 100 c.c.	A. H.E.								
	Grammes.	Grammes.	Grammes.		Grammes.		Grammes.					
Works A. (cyanide absent).	1·728	0·453	1·275	75·0	1·307	59·4	0·2287	13·45	72·85	− 2·15	− 2·87	18·5
	Average per cent. H_2S calculated (allowing for associated air)										= 18·1.	
	,, ,, found in saturator gas by Bunte burette										= 18·4.	
Works B. (cyanide present).	1·972	0·365	1·607	94·5	1·375	62·5	0·522	30·7	93·2	− 1·3	− 1·4.	32·6
	Average per cent. H_2S calculated (allowing for associated air)										= 32·3.	
	,, ,, found by Bunte burette										= 32·9.	

The presence of some of this ammonia—perhaps a large proportion—may frequently be attributed to imperfect absorption in the saturator. In some cases saturators have been found designed with so steep an angle in the bottom from back to front that when there is ample depth of acid in the front or fishing part of the saturator, where the sulphate formed is withdrawn from time to time, either mechanically or by hand, the ammonia-distributing pipe in the closed portion at the back is either unsealed or has too small a layer of acid liquor above it to ensure neutralization of the ammonia passing in bubbles of greater or less dimensions. This defect, in one instance, has led to the discarding of a new and expensively constructed saturator. Similar losses may occur from neglect of the attendant to maintain sufficiency of acid at any period, especially when the level of liquor in the saturator is being lowered by withdrawal of the salt; also from gradual enlargement of the holes in the ammonia-distributing pipe above referred to, after the lapse of time, causing the vapours to issue through the acid in too great volume at particular points, so that acid and ammonia are not in actual contact. In some works the liability to losses of this character is recognized, and provision is made for scrubbing the gases, after leaving the saturator, with fresh sulphuric acid flowing to the saturator in a suitably-devised arrangement for bringing the gases into close contact with thin films of acid. The point concerns the manufacturer from the economic point of view. The presence of escaping ammonia, however, does not add any difficulty to the problem of dealing with the residual noxious gases escaping from the process.

Study of the preceding table, however, shows that the hydrocyanic acid present in certain gas liquors may bear such a considerable proportion to the sulphur present as sulphide that, were the whole of the former converted into ammonia in the kiln, the yield of sulphur would be most materially diminished. In example 2 in the above table as much as 13 per cent. of the sulphur in the gases might appear as ammonium sulphate in the sulphur "flowers" chamber; the available sulphur only amounting to 87 per cent. of that possible had cyanide been absent.

It became of interest, therefore, to ascertain, by concurrent inlet and outlet tests, extending over several hours (to cover all periods of working), the exact relation existing between the amounts of ammonia in equivalent volumes of gases entering and leaving the kiln at works where the presence of ammonium salts in the recovered sulphur was an undoubted fact. This it was possible to do at works B. The following method was adopted.

(1) *Inlet Gases.*—3·1 cubic feet of saturator gases were slowly aspirated (4½-hour test) through a bottle containing dilute acid to decompose the volatile ammonia compounds—sulphide, carbonate, cyanide, &c.—and fix the ammonia.

(2) *Exit Gases.*—1·508 cubic feet of exit kiln gases (= approximately 1 cubic foot of saturator gases entering) were similarly aspirated through 200 c.c. of water over the same period.

Analysis of Resulting Solutions.—The ammonia in both samples was determined by distillation with excess of caustic soda. The results are fully set out in the following table:—

—	Claus Kilns in Gas Liquor Works,						Chance-Claus Process Kiln.
	1.	2.			3.		4.
		Selected Lump.	Stalactite from Hot Chamber.	Representative Bulk Sample.	Selected as "Rich in Ammonia."	Selected as "Poor in Ammonia."	
Appearance	Dirty yellow with blue patches.	Clean, pale yellow.	Clean, dark yellow.	Dirty, pale yellow.	Dirty yellow.	Dirty yellow.	Pure yellow.
Moisture, loss at 95° to 100° C	13·95	7·90	..	3·40	..	..	..
Sulphate of ammonia $(NH_4)_2SO_4$	4·80	72·00	1·20	22·45	1·95	0·12	..
contains NH_3	1·23	18·55	0·31	5·78	0·50	0·03	Nil (Confirmed by Nessler's test.)
Sulphur, extracted by carbon bisulphide	73·05	17·50	..	60·75	..	..	..
Free acid, in terms of H_2SO_4	0 35	0·40	Nil	0·95	..	..	..
Soluble sulphur, in forms other than above, in terms of sulphur	0·75	1·20	..	0·95	..	..	..
Non-volatile, at red heat	4·75	0·40	..	8·35	..	..	..
Difference	2·35	0·60	..	3·15	..	..	..
	100·00	100·00	..	100·00	..	..	..
Hydrocyanic acid	absent	absent	..	absent	absent	absent	..
Sulphocyanide	traces	,,	absent	,,	,,	..	..
Sulphurous acid	,,	traces	,,	traces	..	..	..
Thiosulphuric acid	,,	,,	,,	absent	..	..	..
Pentathionic acid	,,	absent	,,	traces	..	..	..
Hydrocyanic acid in gas liquor used—							
In terms of the ammonia (NH_3) equivalent of hydrocyanic acid (HCN). Grammes per 100 c.c.	0·038	0·031	0·031	0·031	..	..	..
In terms of the ammonium sulphate ($[NH_4]_2SO_4$) equivalent of 100 parts of sulphur as sulphide	..	54	54	54	..	..	..

The behaviour of the two solutions under distillation at once indicated a striking difference in the character of the ammonia-yielding contents. The inlet-gas sample evolved only 25 per cent. of the total ammonia obtained from it in the first 150 c.c. distillate, while evolution continued regular and with no appearance of coming to an end throughout the whole period of distillation—4½ hours—with a total distillate of 1150 c.c. The exit-gas sample, on the other hand, yielded the whole of its ammonia in the first 150 c.c.

Ammonia-Yielding Volumes of Inlet and Compounds in Equivalent Exit Gases to Claus Kiln.

Description o. Sample.	Volume of Distillate.	Ammonia Obtained by Distillation. N/2 H_2SO_4 Neutralized (1 c.c. = 0·121 gr ins NH_3).	Ammonia, Grains per 1 C. Ft. entering (= 1·5 leaving Kiln). Evolved in First 150 c.c.* Distillate.	Evolved subsequently.
Inlet Gases.	c.c.	c.c.		
3·1 cubic feet of gas aspirated through 200 c.c. of water acidulated with hydrochloric acid. Volume made up to 250 c.c. and 100 c.c. distilled with caustic soda; water being added from time to time as required to maintain contents of flask.	150	8·1	0·856	= 25 per cent. of total NH_3 evolved.
	150	4·2		
	150	6·55		
	120	3·2		
	100	2·3		
	80	1·7	..	2·565
	100	2·4		
	100	1·8		
	100	2·1		
Total time of distillation about 4½ hours.	distillation stopped.	Ammonia still coming over.		
Total.	1150	32·35	= 3·421 (minimum).	
Exit Gases.				
1·508 cubic feet (approximately 1 cubic foot of gases entering the kiln) aspirated through 200 c.c. of water. The inlet tube gradually blocked with white deposit. Analysis results calculated to 1·508 cubic feet of gas:—				
(1) White deposit from inlet-tube (neutral) made up to 100 c.c., 50 c.c. distilled with soda . .	150	5 6	1 467	..
	50	Nil	..	Nil
(2) Solution in absorbing bottle made up to 250 c.c. as above, 100 c.c. distilled with soda . . .	150	11·4	3·734	..
	50	Nil	..	Nil
Total.	..	..	5·201	Nil

* The first 150 c.c. of distillate may be considered to include the whole of the ammonia existing as such in the solution; that yielded by subsequent distillation is derived from the decomposition of nitrogenous bodies—*e.g.*, cyanides, &c.

Analysis of White Deposit (1) *in Tube per* 1·508 *Cubic Feet of Gases Leaving.*

Sulphur, not estimated (large amonnt).	
Ammonium carbonate.	Absent.
,, sulphide	Absent.
,, sulphite	0·475
,, sulphate (by difference)	0·992
Total ammonia (grains) . . .	1·467

For the suggestion that the source of the additional ammonia in the exit gases might be found in volatile cyanogen compounds in the foul gases, and originating in the gas liquor used, we are indebted to Mr. F. N. Sutton, then assisting in the conduct of the experiments at works B.

It is quite obvious from these results that the amount of ammonia entering the kiln as cyanide and carbonate (not exceeding 0·856 grain NH_3 per cubic foot of saturator gases) is insufficient to account for the ammonia as sulphite and sulphate in an equivalent volume of the gases leaving (5·201 grains NH_3), and that the inlet sample must have contained, in addition to the comparatively small proportion of volatile ammonia compounds (carbonate, &c.), nitrogenous compounds that slowly yield ammonia on distillation with soda—*e.g.*, hydrocyanic acid which yields sodium formate and ammonia under these conditions.

$$HCN + NaHO + H_2O = NH_3 + HCOONa.$$

An analysis of the inlet sample (1) showed that it contained hydrocyanic acid equivalent to 8·81 grains HCN—5·57 grains NH_3 per cubic foot of saturator gases—an amount more than sufficient to account for the whole of the ammonia leaving the kiln, even if we disregard the fact that the tension of hydrocyanic acid is such as to render it probable that only a portion of this body actually present in the saturator gases was retained in the acid absorbent used.

This interesting result led to the working hypothesis that the ammonia found in these exit gases is in large measure due to the decomposition of cyanogen compounds in the kiln by steam resulting from oxidation of the sulphuretted hydrogen by air—

$$HCN + H_2O = NH_3 + CO,$$

a reaction analogous to the formation of ammonia from metallic cyanides when heated with steam, (*Vide* Watts' Dictionary, Vol. I., p. 197; also Lunge's "Coal Tar and Ammonia," third edition, pp. 674-682.)

This hypothesis has been put to experimental proof, and sufficient evidence has been already obtained to justify its adoption, as the results of experiments given below indicate that very substantial conversion of hydrocyanic acid into ammonia takes place when a mixture of that gas and carbon dioxide is passed through a highly heated contact material—*e.g.*, broken brick, with excess of steam—and that this percentage was increased when sulphuretted hydrogen was added to the carbon dioxide and water vapour. The apparatus employed in the preliminary work was on the lines adopted for the laboratory Claus kiln experiments described in the Alkali Act Report for 1899, pp. 181 to 184.

The results obtained are set out on p. 115 in parallel columns to facilitate comparison. The yield of ammonia in experiment 1 is very satisfactory, considering the fact that this body commences to dissociate into its elements at a temperature of 500° C., and also that no special precautions were taken to exclude the oxygen of the residual air (5 to 8 per cent.), which can hardly fail to have some destructive action on ammonia at the high temperature employed, and, in addition, reacts with hydrocyanic acid itself to form carbonic acid, water, and nitrogen.

It is not desired at this stage to attempt to draw any conclusions from these experiments as to the conditions most favourable for a high yield of ammonia; but it is hoped that opportunity will be found during 1904 to determine the data required to decide the exact limits of the reaction under a range of conditions inclusive of those operating in the Claus kiln, where vapour of sulphur, sulphuretted hydrogen, and sulphurous acid are present to modify the reaction, and also to ascertain whether other nitrogenous bodies—*e.g.*, pyridine and other bases—are contributing factors to the yield. The possible influence of this reaction on the yield of ammoniacal liquor from gas-retorts, coke-ovens, and especially from producer-gas processes where large quantities of steam are admitted, is one that is not lost sight of. The conversion of cyanogen into ammonia has indeed from time to time engaged the interest and attention of many technological chemists.

Estimation of Cyanide in Ammoniacal Liquors.

The method devised in this research for the estimation of hydrocyanic acid in the ammoniacal liquors examined consisted in distilling the liquor with excess of tartaric acid into caustic soda in an apparatus provided with receiver and Liebig's condenser similar to that employed for the estimation of fixed ammonia; lead nitrate being added in excess to retain the sulphide, and ferric chloride to convert any ferrocyanide present into prussian blue—a substance which evolves no hydrocyanic acid under the observed conditions. The cyanide obtained in the distillate was determined by titration with N/10 silver nitrate or N/10 iodine in the usual way.

The results in the preceding table clearly prove that a large conversion of hydrocyanic acid into ammonia is effected by the agency of steam in presence of a catalytic substance maintained at a temperature of 300° to 600° C., and that Claus-kiln conditions *quâ* sulphuretted hydrogen are specially favourable to a high yield. We have now to inquire how far such a reaction as

$$HCN + H_2O = NH_3 + CO$$

is likely to affect the kiln reaction itself in gas-liquor works, where cyanides are not infrequently present in the reacting mixture. No complete data are yet available for tracing the kiln reactions by quantitative estimation of the gaseous constituents at various stages in their descent through the kiln. We are compelled to rely, therefore, in this preliminary inquiry, upon analyses of the final gaseous mixture leaving the kiln and chamber, and of the solid and liquid products that separate.

As regards the base—ammonia—the tests at works B indicate that a large proportion of that found in the exit gases from the kiln—certainly not less than 85 per cent. of the total amount found on the occasion of our tests—was derived from the decomposition of cyanides by steam. It is impossible to state the exact proportion in any given instance, because no means exist of ascertaining how far the ammonia entering the kiln as such, during periods of irregular working of the saturator, survives the high temperature in what we may call the oxidizing zone of the kiln, where oxygen is present in large excess over that required for the simple reaction—

$$H_2S + O = H_2O + S$$

(the excess amounting in one case to over 200 per cent.), and where steam is at a minimum. Whatever its previous history, however, ammonia is undoubtedly present in the exit kiln gases, mainly in combination with sulphuric acid as ammonium sulphate, but in lesser degree also with sulphurous acid as ammonium sulphite. The latter body would, of course, rapidly suffer oxidation to sulphate when the recovered product is exposed to the air on opening the chambers.

—	Sulphuretted Hydrogen Absent.				Sulphuretted Hydrogen Present.
	Blank.	1.	2.	3.	4.
Temperature of contact material by Siemens calorimeter . . . . . ° C.	565	565	395	305	390
° F.	1050	1050	745	580	735
Rate of flow of exit gases (approx.), 16° C. 760 mm. (including steam)—					
c.c. per minute	460	660	590	610	820
,, ,, per c.c. packing . . .	0·58	0·82	0·74	0·76	1·02
Total steam present in reacting mixture . . . . . Grammes	1·0	8·500	9·000	7·000	11·000*
Potassium cyanide taken . . ,,	Nil.	2·203	2·203	2·368	2·203
Equivalent to hydrocyanic acid. ,,	..	0·913	0·913	0·982	0·913
,, to ammonia . . ,,	..	0·5752	0·5752	0·6183	0·5752
Ammonia recovered . . . . ,,	Nil.	0·2593	0·3443	0·3081	0·3783
,, per cent. of total as cyanide taken	..	45·0	60·0	50·0	66·0
Gas analysis, during run—					
Entering decomposer . . CO_2 per cent.	98·5	98·5	98·5	98·5	98·5
Leaving ammonia catch . { ,, ,,	..	..	..	90·0	70·4
{ O ,,	..	..	..	..	0·2

* The conditions of the experiment rendered it impossible to determine the amount of steam resulting from partial oxidation of the sulphuretted hydrogen admitted to the decomposer by adventitious air. Analysis proves that sulphurous acid, free sulphur, and sulphuretted hydrogen were all present in the gases leaving the kiln; thus closely imitating actual Claus kiln conditions of working on the manufacturing scale.

The origin of the sulphuric acid found in combination with ammonia in the exit kiln gases has an important bearing on the Claus-kiln reactions. Free sulphuric acid does not appear as a final product of the kiln reaction in normal working, either in the Chance-Claus process or in the Claus process as applied in gas-liquor works; the small traces of that acid found in the recovered sulphur in certain parts of the chamber being attributed entirely to the oxidation of occluded sulphurous acid on exposure to air. The presence of combined sulphuric acid in the latter class of works appears to be governed entirely by the presence of ammonia in the reacting mixture in actual or potential form (as hydrocyanic acid); and under such conditions sulphuric acid must be regarded as much a product of the kiln reaction as sulphurous acid itself. Whether it is formed in the upper and oxidizing zone of the kiln in normal working, to be subsequently reduced by the vapour of sulphur and sulphuretted hydrogen in the lower zones, when ammonia is not present to combine with it, is a question that can only be decided by a complete analysis of the gases, extending to an estimation of all its constituents. Indirect evidence, however, in the case of works B does exist, suggesting this formation and survival—in the fact that the oxygen deduced from the products of the kiln reaction (water and free sulphur) shows a marked divergence, being 2·6 grammes in place of 13·6 grammes entering the kiln as deduced from gas analysis; while in the case of works A, where no cyanogen is present, the amounts were 9·1 and 9·7 grammes respectively (see table). Analysis does prove, however, that sulphuric acid and ammonia are ultimately present in the recovered sulphur in equivalent proportions, and that we may take the amount of ammonia as governing the amount of sulphuric acid that survives. We have shown that the quantity of ammonia itself in normal working is controlled by the hydrocyanic acid present in the reacting mixture, and the conclusion is reached, therefore, that this latter body is a factor that governs the character of the recovered sulphur to a very material extent. Given the amount of cyanide and sulphide in the gas liquor, we can calculate the percentage amounts of free sulphur and ammonium sulphate in the recovered sulphur. The result is interesting and instructive. Thus, taking works B and C, we have per 100 parts of gas liquor used—

—	Works B.	Works C.
Total H_2S entering kiln in terms of sulphur . .	0·362	0·220
Less sulphur combined with NH_3 as $(NH_4)_2SO_4$	0·033	0·029
Net free sulphur by difference	0·329	0·191
Ammonium sulphate equivalent of HCN entering kiln	0·135	0·119
Total product recovered	0·464	0·310

Whence, per 100 parts of dry recovered product—

—	Works B.	Works C.	
	Calculated.	Calculated.	Found.
Free sulphur	71	62	63
Ammonium sulphate	29	38	23

Note.—The above calculations are entirely theoretical. They indicate the percentage composition of the recovered sulphur on the assumption that the ammonium sulphide and cyanide in the gas liquor yield the full equivalents of sulphuretted hydrogen and hydrocyanic acid respectively in the reacting mixture, and that reactions proceed to completion to free sulphur and ammonium sulphate. No exact data yet exist for attempting a solution based on practical working.

The paper was accompanied by a very full appendix containing a mass of calculations bearing upon the subject.

THE PRACTICAL DEFINITION OF "PURE AND WHOLESOME WATER" AND "POLLUTION."

By JOHN C. THRESH, M.D., D.Sc., F.I.C., &c.

[A Paper read before the British Association of Water-Works Engineers, with an Abstract of the Discussion.]

Recent developments of chemical, bacteriological, and practical research as regards the character of water supplies have brought the subject of this paper into great prominence; and it must be admitted that, in the interests alike of water authorities and consumers, its importance cannot be overrated. The public demand to be supplied with what is defined in various Acts of Parliament as "pure and wholesome water"—that is, water free from pollution; and water engineers are anxious to meet their requirements. The misfortune is that there are such diversities of opinion as to what constitutes a pure and wholesome water, that neither engineers nor the public know what to believe. For example, we have experts of the highest eminence affirming that the water supplied to London is pure and wholesome, and pointing to the practical experience of the last thirty years as evidence thereof; while other experts of equal eminence affirm that the water is so dangerously polluted that those who use it run the risk of contracting disease, and even suggest the possibility of London being decimated by typhoid fever or cholera. The former base their opinion mainly on the evidence of experience; the latter on the assumption that certain theories are true. The majority of chemists agree that the water is wholesome; but most bacteriologists say that the organisms it contains indicate dangerous pollution. In many other instances there is conflict of opinion between chemists and bacteriologists, and still again between chemists and chemists, and bacteriologists and bacteriologists. There is thus no wonder that both the public and engineers are bewildered.

The reason of this state of affairs, no doubt, is that the subject is studied by many of these experts from one point of view only. The bacteriologist knows that certain organisms are chiefly found in sewage, and therefore if he finds them in a water he at once condemns it. The chemist knows that the purest water contains the merest trace of organic matter and of ammonia, whereas both are abundant in sewage. If, therefore, he finds a slight excess of these in a water, he condemns it as polluted; whereas if there is no such excess, he passes it as pure. Few experts of either class make a practice of in every case studying the subject as a whole—that is, by examining the source of a water, recording its history, and the effect it has on the health of the community drinking it, and comparing these practical data with the result of both chemical and bacteriological examinations. As a matter of fact, very few persons have the opportunity of combining the study of general data such as indicated above with the necessary analysis and examinations; but unless they have done this, it is impossible for them, at least in many cases, to give a reliable opinion on the character of a water. A water which the chemist may pronounce pure may be dangerously polluted; one which he may declare to be polluted may be perfectly wholesome; and the bacteriologist may easily condemn a water which, on fuller investigation, would be found to be of satisfactory quality. Why this should be so we will discuss directly.

Perfectly pure water does not occur in Nature. All waters contain bacteria, traces of organic matter, gases, and salts in solution, taken up from the air or in their passage under ground. In traversing soil and rocks, water may take up mineral matter, or become contaminated by sea water, or other water of objectionable origin, and so become unfitted for domestic or manufacturing purposes. Under such circumstances, though it may not be rendered actually unwholesome in the sense of causing ill-health, it is not considered hygienically pure, since it is not fit for domestic use; and it is in this sense that the word "pure" is

generally used. We may, therefore, define a "pure" water as one which contains no constituents—animal, vegetable, or mineral—which render it unfit for domestic purposes; but, as will be seen later, the author would prefer to call such a water "wholesome," and restrict the term "pure" to waters which are also bright, odourless, &c. The chemist can, of course, determine the nature and amount of the substances of mineral origin present in the water, and from his results the medical experts can say whether these are objectionable either in quality or quantity. Water may, however, take up animal and vegetable matter; and if these are present in excessive quantity, the chemist can detect them. But, unfortunately, he can neither accurately estimate the quantity nor say anything definite about the quality. For example, it has been shown over and over again that chemical analysis cannot detect the presence of less than 1 part of sewage in 1000 parts of water—quite a considerable proportion (about two teaspoonfuls in one gallon). Such an amount adds so little organic matter to the water as to be far within the normal limits of variation of water from any one source. On the other hand, the bacteriologist can detect 1 part of sewage in 1,000,000 of water, providing that the sewage is fresh and the examination is made within a few days of the pollution occurring.

When the chemist detects an excessive amount of organic matter in any water, it must undoubtedly be described as impure; but it does not always follow that it is polluted or unwholesome. When the bacteriologist detects the presence of organisms which in association are, so far as we know, only found in sewage and excremental matter (using reasonable quantities of the water for examination purposes), then the water is polluted even if the chemist finds no excess of organic matter. If no such organisms are found in a water which the chemist pronounces impure, then the water is not dangerously polluted, and though impure may still be wholesome.

The author would therefore define the various terms as follows: A pure water is one which is bright, odourless, and free from obvious colour, contains but the merest trace of organic matter, and no mineral constituents objectionable either on account of their quality or quantity, and which is free from organisms derived from sewage or manure. A wholesome water may be a pure water or a water containing only such impurities as would have no effect upon the health of persons drinking it. An impure water is one which contains either objectionable mineral constituents, mineral constituents in excessive amounts, or more than a minute trace of organic matter, or organic matter of an objectionable type. A polluted water is an impure water containing traces of sewage or similar contaminating matter of a possibly disease-producing character.

Although it is a comparatively simple matter thus to define certain classes of water, difficulties at once arise when it is desired to classify individual waters in these groups. This, however, can be done, provided the water and its source have been properly examined. In this connection a few typical examples will be instructive. Take first the water supply to London—or, rather, that portion of it which is derived from the Thames and Lea. These rivers are undoubtedly polluted, and the water, as taken by the Water Companies, must be described as "polluted." But before being delivered to the consumers, it is submitted to various processes of sedimentation and filtration, which remove at least a very large proportion of the bacteria and some little organic matter. If the filtration, &c., has removed such a proportion of the bacteria that organisms characteristic of sewage can no longer be found in it (using reasonable quantities of water for the purpose of test), and the organic matter has been reduced to the amount found in admittedly "pure" waters, then the author would not hesitate to classify this filtered water as "pure." There is no doubt that, on occasions, the water is actually delivered in this condition; but usually the bacteria present, though few in number, include some of intestinal origin, and characteristic of sewage. So long as these are very few, the author would have no hesitation in characterizing the water as "wholesome," though not strictly "pure." In arriving at this conclusion, he is influenced by the fact that for very many years some 6 million people have been using this water without the slightest proof being adduced of its having prejudicially affected their health. Such an important fact should surely override any statement based on theory, and justify us in placing the London water in the "wholesome" class.

For another example, take the large number of moorland and upland surface waters. If the moorland surfaces are not populated, the water may be delivered to the consumer in an unfiltered condition, in which case it will certainly contain low forms of vegetable and animal life in suspension. I do not regard such waters as "pure," though they are undoubtedly "wholesome;" and if filtered so that these organisms are removed and delivered in a uniformly bright and well-filtered condition, then such waters should be classed with the "pure" waters. On the other hand, water derived from a watershed on which there are farms and houses, or stored in reservoirs to which even small quantities of sewage gain access, must, in an unfiltered condition, be more or less polluted; but if properly filtered it may be classed among the "wholesome," if not among the "pure" waters. Where the gathering-ground is moorland covered with peat deposits, the water will contain vegetable matter in solution. Such water, if the soluble matter taken up from the peat is not excessive, may be classed as "wholesome," though it could scarcely be described as "pure." The action of these peaty waters on lead is well known, and a water which may be wholesome in the reservoirs or in the mains may become impure or unwholesome in passing through a length of lead pipe to supply a house.

Shallow well waters or subsoil waters (including spring water) form a group the members of which are often difficult to classify. Water in percolating through the soil takes up manurial and vegetable matter, and becomes polluted; but as it descends through the subsoil, it undergoes changes, brought about by physical, biological, and chemical action. The physical action is the filtration and removal of bacteria; the biological and chemical actions effect the destruction of the organic matter, with the formation of nitrates and carbonates. If by these actions practically the whole of the organic matter is destroyed and all the recognizable bacteria of manurial origin are removed, the water may be regarded as pure and wholesome. If traces of organic matter remain, but the organisms present do not indicate recent sewage pollution, the water, though not capable of being classed as "pure," may still be "wholesome." But if the water contains organisms indicative of sewage or manurial pollution, the water must be considered "polluted." In dealing with subsoil water, however, it is impossible to lay down any sharp lines of demarcation, as, under certain circumstances, polluting matters may be carried with the water through the subsoil at so rapid a rate that time is not allowed for the natural purifying processes to become complete. Hence a source may at one time yield a "wholesome" and at another a "polluted" water; and such a course cannot, of course, be considered safe. On the other hand, the question whether or not any source should be considered safe can only be determined by a careful examination of it, supplemented by both chemical and bacteriological examinations of water taken under varying circumstances.

Deep wells usually yield "pure" water, but not infrequently the water contains salts of magnesium, calcium, &c., in objectionable quantities; and sometimes sea water gains access to it, thus rendering it impure and possibly unwholesome. If sewage gains access to it in appreciable quantities, the water, of course, becomes "polluted."

Accepting the definitions just given, it is obvious that where sewage can be seen entering a well, stream, or reservoir, the water can, without hesitation, be pronounced "polluted;" but if such contamination is not seen, but only surmised, the question of whether or not a water is polluted must be settled by the results of chemical and bacteriological examinations. Here is the cause of all our troubles. What one analyst will pass as "wholesome," another will condemn as "polluted;" and the author fears that this condition of affairs must continue until chemists and bacteriologists extend their studies beyond the limits of their laboratories, and take into account the evidence of practical experience. Small quantities of polluting matter cannot be detected by the chemist. On the other hand, the bacteriologist can detect exceedingly small amounts of pollution; apparently, some can even detect pollution where it does not exist! Certain organisms which occur in large numbers in sewage are frequently found in waters. They are found in all manurial matter, in road dust, &c.; but the presence of any one of them in water may either have no significance, or may indicate sewage pollution. Taken alone, the author does not regard the presence of the *bacillus coli communis* in small numbers as any proof of pollution, as, if sewage has gained access to the water, there will be other sewage organisms present and capable of detection; and unless these other organisms are found in association with the *B. coli*, there is, in his opinion, no proof of pollution. This, however, is a subject which would perhaps be more suitable for discussion at a meeting of chemists than that of an association of water-works engineers; and the author would refer anyone wishing to study it further to a paper recently contributed by Dr. Sowden and himself to a meeting of Medical Officers of Health, in which it is urged that if bacteriologists will be guided by the results of practical experience, their opinions will be reliable; but so long as the evidence of experience is ignored, and the character of the source left out of consideration, we must continue to have waters from dangerous sources passed as pure, and perfectly safe and wholesome waters condemned as polluted.

Discussion.

Dr. MITCHELL WILSON, the Medical Officer for the East Riding of York, said the paper was one to which the deepest consideration should be given. He knew of no subject at the present time so disappointing as the question of water analysis, both to engineers and the public generally. He thought the majority of the people had become reconciled to the plea of the Local Government Board, that analysis might indicate to them the danger, but not the safety. He thought the paper a welcome one because it was an endeavour to bring about an agreement between Analysts, Medical Officers of Health, and everyone interested in the subject, upon a common standard or a common definition of the terms used. He thought they ought at once to agree to a standard. He would also ask whether the time had not come when the analysis of water should not be looked upon as a sort of puzzle which the public set the analyst to solve. Dr. Thresh had very wisely put before them the need for analysts to be supplied with every detail of the sources of the water, and everything that would help them so far as its surroundings went. He was afraid that at present it was hopeless to expect any agreement among

analysts in their verdicts upon water. He thought they were so constituted mentally that some of them were more cautious than others. There was another aspect of the question which was too little considered. The rainfall might go a long way to alter the condition of the water; and the statement recently made that the water supply was satisfactory until a heavy rainfall occurred, was very poor comfort to the users of the water. It went back to this, that if the public were to trust to the water analyst as a guide, an analysis ought not to be made at intervals of a few years, but at repeated and frequent intervals, so as to give during a certain year the sum-total under all circumstances. He thought they were not unwise to set the standard of wholesome water very high; and having done this, to continue to protect the sources of supply. They would then have less fear of any evil results following.

Mr. R. E. MIDDLETON said it was, as Dr. Thresh had truly remarked, absolutely impossible to provide pure water in the chemical sense. Organisms permeated everything, and were necessary to health; and therefore it was not desirable to eliminate them altogether, even if it was possible to do so. River water must necessarily have received sewage in some form or another; but he thought it might be taken as a fact that where filtration was carried to its best results—eliminating all dangerous elements—and where it was done with care, and frequent analyses were made of the water, both chemically and bacteriologically, the danger to health was infinitesimal if not absolutely *nil*. Was it possible to protect themselves altogether from zymotic diseases? They heard of cases of typhoid in every town and village; but these were not necessarily due to any defect in the water supply—in fact, when investigations had been made, as in London, it had been found that the cases had never been due to the water as supplied to the consumer. They might have been caused by the consumer taking from a cistern water which had become turbid. With regard to the presence of the *bacillus coli communis*, he believed it to be a fact that it was not altogether easy to look into this particular organism, which was similar in many respects to several others of a perfectly harmless character. It was present everywhere; and if it was found in water that had been filtered and protected in every possible way, there was no danger existing, because it must be found in conjunction with other organisms. Before water was distributed, the filtration should be as perfect as it could be made.

Mr. H. ASHTON HILL (Birmingham) remarked that the key-note of the paper was the reference to the value of inspection.

The SECRETARY (Mr. Percy Griffith) referred to a town about 15 miles from Hull, which he said was situated in a district which was perhaps one of the worst with regard to a water supply in the country; and he had looked into the matter as an engineer. The investigations must at a certain stage bring one into the arena with the medical officer and analyst; and two gentlemen were consulted. Their recommendations were, for practical purposes, the reverse of each other—in fact, antagonistic. The reason for this was, he thought, the difficulty and uncertainty existing with regard to the acceptance of a water as pure or impure. In the case in point, the investigations were more or less completed, and the circumstances of the gathering-ground and sources of supply were well known to the experts; and yet they differed. He would plead with the analytical experts to "hurry up," and find some basis of agreement which engineers might act upon with the powers at their disposal. It was impossible for them to act effectively when experts differed.

Dr. THRESH briefly replied, and the discussion closed.

An industrial establishment to employ gas-engines solely for power purposes is the Union Switch and Signal Company, Swissvale (Pa.). For four years 500-horse power of Westinghouse three-cylinder vertical gas-engines of the direct-connected type have been in use; and now a 300-horse power Westinghouse horizontal gas-engine of the double-acting type is to be added to the equipment. This engine is to have two 16½ in. × 24 in. cylinders arranged in tandem. As regards the performance of the older plant, a test of one of the engines gave the following results: 148 brake horse power, 10·2 cubic feet per horse-power-hour; 123·5-horse power (full load), 10·5 cubic feet, or 9920 thermal units, per horse-power-hour.

According to a Blue-book just issued, the total number of persons employed in and about all the mines of the United Kingdom last year was 871,889, of whom 842,066 worked at the 3449 mines under the Coal Mines Act, and 29,823 at the 673 mines under the Metalliferous Mines Act. Compared with 1902, there is an increase of 17,275 persons at the mines under the former Act, and a decrease of 989 persons at those under the latter Act. At the quarries under the Quarries Act there were 98,155 persons employed. Compared with 1902 there is a total increase of 1047 in the number of persons employed at quarries. The total output of minerals at the mines under the Coal Mines Act was 243,243,586 tons, of which 230,324,295 tons were coal, 3,066,835 tons fire-clay, 7,473,236 tons ironstone, 2,009,602 tons oil shale, and 369,618 tons sundry minerals. With 10,174 tons from open quarries, the total output of coal was 230,334,469 tons—an increase of 3,239,427 tons on that of the previous year. In 1902 the average output of mineral at mines under the Coal Mines Act was 362 tons per person employed underground. Last year the corresponding output was 359 tons—a decrease of 3 tons per man.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Mixing Breeze with Coal at the Nanterre Gas-Works.

SIR,—I do not consider myself called upon to reply to Mr. Graham's personalities.

As to the breeze mixing, we have had so much testimony now from so many quarters that I need say little beyond pointing out that the long quotation by Mr. Herring of Mr. Carrick Anderson's "Chemistry of Coke" does not help his case at all. It has no reference to breeze, nor has the process recommended of mixing the varieties of coal dust for coking (such dust being always previously washed and cleaned from earthy matter) the slightest analogy with what M. Lhomme had to do to make his retorts work.

He has told us—in a candid, plain, businesslike letter—what he did, and why he did it. M. Derval—in an equally simple and creditable letter—has confirmed M. Lhomme's statement, and made it clear, in spite of the claim made for someone in Messrs. Graham, Morton, and Co.'s employ that he was "the man" (no joke here) who hit upon this device (and that is all it can ever chance to be) for getting the retorts to work. Mr. Marshall has enlisted our sympathies for M. Lhomme's difficulties; and personally I appreciate both his resourcefulness and his courage, for he has the responsibility of making the works pay.

Mr. Bourne, late of Milan, on his side, and Mr. Carpenter—one of the highest authorities in the kingdom—on the other side, have both told us of the futility of this way of increasing coke returns; and in spite of Mr. Herring's sneer at "Metropolitan" systems, the day is far distant when, with the coals available in the South of England, inclined retorts will be accepted generally or extensively among them.

Palace Chambers, S.W., July 10, 1904. H. E. JONES.

Mr. H. E. Jones and the Nanterre Gas-Works.

SIR,—I do not think it would be right, either in the interests of my Company or Mr. Jones, to close this correspondence without informing you of the result of a communication which my Company's Solicitors addressed to the Solicitors of L'Union des Gaz, in reference to Mr. Jones's visit to Nanterre. These gentlemen explained, in their reply, that Mr. Jones went over the Nanterre works in company with Mr. Gardiner (one of the Directors of L'Union des Gaz), and they wrote as follows:—

> It is obvious that Mr. Jones's remarks [those are the remarks he made at the meeting], suggesting as they did that our clients [that is L'Union des Gaz] could neither build nor get built nor work inclined retort-settings, are quite as obnoxious to them as they can be to your clients. Mr. Jones's remarks are, in fact, regarded by our clients, to whom they appear quite uncalled for, as quite inappropriate to his position.

I make no comment upon this, except to say that I heartily agree with it, and think it should be a lesson to Mr. Jones not officiously to volunteer observations about matters which do not concern him.

Perhaps Mr. Jones would like a "casual visitor" to Stepney to air his opinion of Mr. Jones's plant at the next annual meeting of the Institution of Gas Engineers.

Mr. Jones thoughtlessly opened this subject—no doubt with the old-fashioned idea that the contractor must consider himself "crushed" directly Mr. Jones spoke. I hope that he will not deceive himself any longer.

Leeds, July 7, 1904. MAURICE GRAHAM.

Coal and Water Gas from Vertical Retorts.

SIR,—Referring to your article on vertical retorts, in the "JOURNAL" for May 31, we beg to state that Mr. Isbell is simply copying what others have done before him. My father, Mr. Adam Weber, obtained a patent on March 28, 1876 (No. 175,536), which was tried successfully at the 42nd Street works of the Consolidated Gas Company—then known as the Metropolitan Gaslight Company. These retorts were tried also for the manufacture of coal gas.

Conducting a series of successful experiments at the Williamsburg Gaslight Company, North 12th Street, and Kent Avenue, Brooklyn, steam was introduced under the vertical retorts for the identical purpose of that claimed by Mr. Isbell as a novelty. The data received from this vertical coal carbonizing plant, which consisted of two elliptical retorts—15 inches by 26 inches on the smaller and 16 inches by 30 inches on the larger or lower end, and 10 feet high, were extremely interesting and valuable. At the proper time these results will be published and given to the gas profession. Experiments were conducted over a period of two years, but they did not hold forth the promises hoped for by ourselves. The experiments with the Williamsburg Gaslight Company took place about eight years ago.

We are confident that vertical retorts must be serviceable for coal carbonizing. It has been a life-study of our firm; and we have conducted experiments with vertical clay retorts in actual operation by similar processes for the past 35 years. Mr. Isbell has never seen a vertical clay gas-retort in operation. The design of his retorts is obviously crude and unpracticable in all up-to-date gas engineering.

The use of steam for the purpose of making hydrogen gas and loosening the charge from the walls of the retort, has been employed by us for so many years at different works using vertical clay retorts (not gas-works) that a patent issued upon this claim is worth nothing. In fact, it is one of the elementary propositions in vertical carbonizing, no matter what the material is which is to be carbonized.

During the past six months, we have designed and effected what we consider a little improvement upon using vertical clay retorts; and we propose to take an early opportunity of giving you full details of the results of this new design.

Mr. Dietrich's patents—which give tribute to the surpassing excellence of his design and engineering skill—are largely based upon the experiments made jointly by him with my father, Mr. Adam Weber, in the early seventies. Mr. Dietrich was the Engineer of the Metropolitan Gaslight Company of New York City. It is a great pity he did not continue the engineering force of these works to further investigate and develop his idea of manufacturing gas in vertical retorts. However, he has done lots to advance the art.

ADAM WEBER SONS,
New York, June 27, 1904. per OSCAR B. WEBER.

The Arrangement of Grids in Oxide Purifiers.

SIR,—Although Mr. Livesey, of East Grinstead, in his letter appearing in your last issue, states that "any practical man can see at a glance" the advantages of his suggested method of filling the purifiers, we are obliged to confess our failure to discover them.

As to pressure due to the purifying material, we take it that the lower particles of a mass of oxide 4 feet thick must necessarily be consolidated in direct proportion to the weight of those superincumbent; and if the gases in passing through attempt to avoid this pressure, they will do so by escaping by way of the inclined grid through the upper layers of purifying material only—thus leaving the lower portion of it unaffected. Certainly, such an arrangement does not in any degree accomplish the advantages offered by the "Jäger" grid, which, as previously explained in your pages, does produce just that uniform distribution and density of the purifying material—however deep the purifiers may be—which is the desideratum.

As illustrating what the "Jäger" system can accomplish, may we mention that, in a letter just received from Mr. Rossum, of the Amsterdam Municipal Gas-Works, he states that, whereas with the ordinary sieves he changed his purifiers within the period from January to June, 1903, no less than 39 times, he has had only during the corresponding period of this year—now they are fitted with the Jäger system of purification—required to change them 19 times.

Millwall, E., July 7, 1904. SAMUEL CUTLER AND SONS.

SIR,—I notice in the "JOURNAL" of yesterday's date a letter headed "Arrangement of Grids in Oxide Purifiers." To me it is quite apparent that the gas, instead of going through the purifying material, will pass up the sides, and not pass through the oxide at all. If the material is properly prepared and properly put into the purifier, back-pressure should be an unknown quantity—whatever the thickness of the layer should be (even 4 feet thick), as your correspondent indicates. I have used natural oxide for 30 years, all thicknesses, and do not know what back-pressure means.

T. D. HALL.
Montrose Gas-Works, July 6, 1904.

Flow of Gas in Mains and Distribution at High Pressure.

SIR,—Like your correspondent, "Inquirer," I have been much interested in Mr. Trewby's statement as to the effect of "boosting" gas; and I hope Mr. Trewby will vouchsafe the explanation asked for by "Inquirer," in an early issue of your paper.

July 9, 1904. ANOTHER INQUIRER.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bill brought from the Commons, read the first time, and referred to the Examiners: Selby Urban District Council Bill.

Bills reported: Gas and Water Orders Confirmation Bill, Lytham Improvement Bill, Thurles Urban District Council Water Bill.

Bills read the third time and passed: Doncaster Corporation Bill, Gas Orders Confirmation Bill (No. 1), Gas and Water Orders Confirmation Bill, North-Western Electricity and Power Gas Bill, Skipton Water and Improvement Bill.

The Dumbartonshire (Vale of Leven) Water Order Confirmation Bill and the Melrose District Water Order Confirmation Bill have been read the first time, and, under the Private Legislation Procedure (Scotland) Act, 1899, deemed to have been read a second time and reported.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bills brought from the Lords, read the first time, and referred to the Examiners: Gas Orders Confirmation Bill (No. 1), Gas and Water Orders Confirmation Bill.

Bills read a second time: Arbroath Corporation Water Order Confirmation Bill, Dunfermline District Water Order Confirmation Bill, Gas Orders Confirmation (No. 2) Bill [Lords], Oakengates, Dawley, and District Joint Water Board [Lords].

Bills read the third time and passed: Airdrie Corporation Gas Order Confirmation Bill [Lords], Filey Improvement Bill, Melrose District Water Order Confirmation Bill, Minehead Urban District Council Water Bill [Lords], Rotherham Corporation Bill, Selby Urban District Council Bill.

We learn that the Cagliari Gas Company have adopted the Jäger system of purification, and have placed an order with Messrs. Samuel Cutler and Sons for four purifiers to be converted to this system.

GLEANINGS FROM THE COMMITTEE ROOMS.

IT is a subject for remark how completely gas measures have escaped from the opposed Committee rooms this session. In the notes below, there are only fragments of information that contain interest for gas suppliers; the remainder touching entirely upon water supply.

The Barnet Water Bill. The Barnet District Gas and Water Company have. unfortunately for them and their district, been worsted in the second encounter with the powerful antagonists of the well they had proposed sinking at Little Berkhampstead. They have lost the well; but they have saved the capital and the other powers sought by the Bill. This is something worth having; but it is not for this that all the fighting and expense have been involved. The refusal of the Duke of Northumberland's Committee to give the Company the well is inconsistent with a rider to their decision. "The Committee do not," said the Duke, "wish their decision to be regarded as founded on any claim which may be put forward by Counsel on behalf of the Metropolitan Water Board to the whole of the water of the watershed of the River Lea." Now with all deference to the noble Lords (who have given such ample proof of the strength of their perception and wisdom during the weeks they have been sitting), their rider contains the very issue which was put before them for decision. If they were not satisfied in their minds that the water which is to be gained from this particular locality is the right of the Water Board, then the claim of the Barnet Company to it for their water-poverty-stricken area ought to have been sustained. The noble Lords burked the question; and although they do not wish it to be so, they have, there can be no denying, strengthened considerably the Water Board's position, and it will be little good any one else trying where the Barnet Company have failed. The Company will now once more have to pursue that weary search for water which they have been persistently engaged in, with constant anxiety for the Directors and their Engineer, Mr. T. H. Martin, now for many years past. The anxiety, instead of lessening, increases; for, while their expensive efforts at amplifying their water resources have not been richly crowned, the popularity of the district and, consequently, the population continue to increase unceasingly. To scan the case again (excepting in our ordinary report) is uncalled for, as, almost in every respect, what happened in the Lords Committee room last week was a re-presentation of what occurred when the Bill was before the Commons Committee. It was in our view, as disinterested onlookers, a case of might against right. The opposition included the Metropolitan Water Board, the Herts County Council, certain District Councils, a Railway Company, the Marquis of Salisbury, and other private owners; and the forensic talent that was brought to bear upon the discussion from all standpoints was remarkable in quantity and quality. The same is true of the expert (but contradictory) testimony. The arguments were not new; but there was one development since the Bill was in the Commons. A great ado was then made about the Company getting, as an alternative to their scheme, a supply of water in bulk from the Metropolitan Water Board; but no one at the time could give any information as to the terms upon which the Board would be prepared to supply. This has since been ascertained; and it is at the rate of 9d. per 1000 gallons with 2d. added for pumping. Yet one of the opposing Councils were asking in their petition that the Barnet Company should be required to supply them at 4d. per 1000 gallons! What sense, or, rather, what nonsense! The ridiculous character of the terms offered by the Board to the Company from the financial aspect was conclusively shown by Mr. E. W. Drew (of Messrs. Wood, Drew, and Co.). On the suggested terms, the net profits of the Company would be seriously affected; and as the population grows, the net profits and the dividends would dwindle until—well, the Company so far as their water undertaking is concerned, might at once begin to think about providing themselves with a winding-sheet. The Company showed their estimation of the import of the Bill and their scheme to their district and themselves by the strength of their representation—legal and expert. They have incurred an enormous bill of costs. This, however, they were bound to do; but it is to be deplored that they have not got, as the result, what they most desired. Sympathy (though it will not avail them anything) will be, for the most part, on their side.

Gas and Water Pipes and Railway Bridges. The Board of Trade are sticklers for observing the general law, and not allowing clauses to find their way into Private Bills and Provisional Orders which attack in any way the sovereignty of the general law. They have frequently raised this point, and it cropped up again over a Provisional Orders Confirmation Bill which was under consideration by a Lords Committee yesterday week. The question in this instance had reference to the payment of wayleaves for pipes over bridges the property of the South-Eastern and Chatham and Dover Railway Company. By arrangement between the promoters and the Company, a clause providing for such payment had been inserted in certain Orders. In the exercise of their discretion the Board of Trade removed it; and Mr. E. E. Cooper, the Railway Company's Parliamentary Agent, appealed to the Lords Committee for its reinsertion. The Committee called Mr. Pelham before them, in order to learn the reasons of the Board for their action. He referred to the point as to the clause altering the general law, which imposed on Railway Companies the obligation, when interfering with a highway, to construct another one sufficient for all the ordinary purposes of a highway, which purposes included pipes and cables for the service of the public. In the opinion of the Board, there is no necessity on the part of any gas, water, or similar concern to pay wayleave to anyone replacing the original highway by a bridge. The Committee upheld the Board, and refused the clause. It is not often a good word is said for the Board; but they deserve one for their action on this occasion.

A Question of Rates. By clause 37 of their Bill, the Leeds Corporation raised the question as to what should be done with the moneys provided by certain rates, to what funds they should be carried, and out of what fund the necessary expenses should be paid. The revenues and outgoings of the gas, water, and tramway undertakings were involved. The clause provided that all

the charges and costs of the undertakings should be paid out of the consolidated fund or rate, and that all revenues should be carried to the same fund. The Great Northern, Midland, and the North-Eastern Railway Companies opposed the clause on the ground that it would subject them to the liability of making larger payments to the rates than they did to-day. Exactly what the change would mean was stated by Mr. Moon, K.C., who appeared for the Companies. He asserted that the effect, taking this year as the basis, would be extra payments for rates as follows: Great Northern, £529; Midland, £1045; North-Eastern, £668; North-Western, £211. This would represent an increase to be paid by the Companies of 11·4d., or 16 per per cent. The Committee could find no justification for altering the position in which the Companies had been for many years, and declined to accede to the clause.

Bolton Water. Bolton was strongly in evidence last Wednesday in one of the Commons Committee rooms when the Provisional Orders Confirmation Bill in which the Borough is largely interested (on account of additional powers for their water undertaking) came up for consideration. Among those assembled in the room were noticed the Mayor (Mr. John Heywood), the Deputy-Mayor (Alderman John Miles), the Chairman of the Water Committee (Mr. F. W. Thompson), the Water Engineer (Mr. R. H. Swindlehurst), and several others. No less than half-a-dozen of the surrounding Authorities were in opposition; the end they had in view being the securing of better terms in regard to water-rentals, &c. The main object of the Bill was to enable the Corporation to raise additional money, principally £105,000 paid for the recently acquired Belmont Estate, which forms a large portion of the watershed from which the Belmont works derive their supply. At the outset, exception was taken to the question of differential charges being raised on the Bill; but this was overruled. Then the promoters set themselves to the task of showing that the charges for water in the outer districts were fair and reasonable. By the morning of the second day's sitting, an agreement was effected, by which the outside districts are to have domestic supplies at the same rates as exist in the borough; and meter supplies at the rate of 8d. per 1000 gallons. Subject to the statutory position of Bolton, and that each consumer shall take or pay for a minimum of 10,000 gallons per quarter, until the Corporation obtain powers to construct further works in connection with their water undertaking, it is agreed that the present charge is not to be increased within their limits of supply.

LONDON GAS COMPANIES AND THE SUPPLY OF ELECTRICITY BILL.

The Select Committee of the House of Lords to whom the above-named Bill has been referred met again last Tuesday, under the presidency of Lord Wolverton. It is a Bill promoted by the Board of Trade to amend the Acts relating to electric lighting; and its main provisions and objects were indicated in the evidence given by the Hon. T. H. W. Pelham, one of the Assistant-Secretaries of the Board of Trade, at the first sitting, as reported in the "JOURNAL" last week (p. 46). The preliminaries having been arranged, their Lordships proceeded to hear the views of the Municipal Corporations Association, the County Councils Association, and the London County Council, as well as the London Gas Companies and certain Electric Light Companies, with reference to the proposals of the Bill. Counsel representing both the Local Authorities and the Companies attended.

Mr. Fitzgerald, who appeared for the Municipal Corporations Association, set forth the objections entertained by that body to the Bill. Mr. Coward, K.C., for the London County Council, supported these objections; adding that the Council desired to be heard on other matters relating to the special circumstances of London. Mr. Cripps, K.C., representing the London Gas Companies, said he should ask their Lordships not to make clause 1 (dealing with the compulsory acquisition of land for generating stations) applicable to London.

Mr. Pelham intimated that the Board of Trade would be prepared to amend the Bill to meet the contention of certain local authorities, that the clause facilitated companies competing with them. They were also prepared to add a proviso that clause 6, sub-section 1, should not apply to any Provisional Order authorizing a company to supply electricity otherwise than in bulk or for power purposes, so far as the Order related to any district in which an Order was in force authorizing a local authority to supply electricity. In order to meet other objections, he further stated that when a large power scheme came before the Board of Trade, they might direct the procedure to be by Bill instead of by Provisional Order, following the lines of the Scottish Local Government Procedure Act; and, further, in the case of mains traversing outside the district or area of supply, that the consent of the local authority should be necessary to the taking up of a road, unless the Board of Trade saw fit to dispense with such consent. After some conversation with reference to subsequent procedure, the Committee adjourned.

On the resumption of the proceedings before the Committee on Thursday,

Mr. Claude Baggallay, addressing their Lordships on behalf of the Metropolitan Gas Companies, thanked them for the privilege of appearing. He said the Gas Companies were not interested in the same way as the Electric Light Companies, nor as the Local Authorities. Their position was that of persons who were competitors with the electric light undertakings. The question of principle he wished to refer to had especial reference to the first two clauses of the Bill. He did not, of course, propose at this stage to go through the two clauses of the Bill, or to criticize its provisions in detail. The Committee would remember that, as the law stood at present, gas companies could not, under the Gas and Water Works Facilities Act, 1870, which enabled the Board of Trade to make Provisional Orders for certain purposes in respect to gas and water undertakings, obtain compulsory powers for the acquisition of land. Section 7 expressly prohibited it. The companies could only acquire land by agreement. The present Bill proposed to give the suppliers of electricity compulsory powers with regard to land purchase, and electric light companies were practically the competitors of gas companies in business. The Bill proposed to give them a privilege which had been refused to the latter companies, and to go back upon the principle laid down in the Act of 1870. Section 2 of the Bill proposed to confer upon electric light undertakers power to interfere with gas mains and pipes, though these were not in roads within their district. What the Bill proposed was to give the undertakers a preferential position in districts in which they were not supplying electricity. It was to this principle of the Bill that the Gas Companies objected. Of course, he knew he had to meet the recommendations of Lord Cross's Joint Committee, before whom the Companies were not heard. There was nothing in the reference to the Committee presided over by Lord Cross which gave any indication or intimation of any raising of this question of the extension of the Provisional Order system before the Committee. The Gas Companies had no opportunity of being heard. He begged to call the attention of their Lordships to the general question of taking land compulsorily by Provisional Order. He did not know whether the Committee were aware that at the present time there was no power to make an Order to take land compulsorily, except for the purpose of enabling local authorities to perform certain public duties. Under the Public Health Act, such power was given with regard to street widening and the erection of municipal buildings. He was not unmindful of the fact that, under the Light Railways Act, power analogous to the Provisional Order system was given to enable companies or other undertakers to acquire land for the purposes of light railways. But this power was different altogether from that which was proposed in the Bill before the Committee. An electric light company, like a gas company, could choose land where they pleased. They were not tied to any position where they might have to put up a building for the generation of energy. Possibly the Committee might ask why he objected to the Board of Trade having power to make a Provisional Order, seeing that the matter would ultimately have to go to Parliament for confirmation. He did not wish to speak invidiously, but he was bound to say that they did object to having the question in practice decided by the Board, on account of the prejudice it raised against them when they came before Parliament. There was no doubt about that. He gave as an illustration the case of the South Metropolitan Gas Company, who were prevented by Parliament from acquiring land on Greenwich Marshes near the river, except two small bits of frontage, on account of the opposition of the owners. But an electric promoter was permitted to have the land which the Gas Company were prevented from acquiring. It was not pleasant for him to say it, but he must remark that there was a general tendency to favour electrict lighting undertakings at the expense of those supplying gas; and the promotion of this Bill was of itself to their minds an indication of it. The Gas Companies objected most strongly to the granting to suppliers of electric light of privileges which had been denied to the Gas Companies, and which were not now proposed to be conferred upon them. It might be said that this could be met by conferring further powers on the Gas Companies; but his answer was that this was opening up a much larger question—viz., the delegation of the powers of Parliament with regard to the acquisition of land. This subject was before a Select Committee of the other House as recently as 1902. The Committee sat to inquire into the conduct of private business, and reported that the extension and alteration of the Provisional Order system was something upon which they felt they could not report, as these two matters should form the subject of consideration by a Joint Committee of the two Houses. He therefore submitted to their Lordships that this proposal to extend the privileges of promoters of electricity supply undertakings was of serious moment, and that the subject ought not to be dealt with in a piecemeal way. There could not be any urgency in respect to this matter, which had lain dormant for six years. He therefore urged that it would be undesirable and impolitic at present to proceed with this Bill, in so far as it related to the proposed extension of the powers given to electric lighting promotions. Lord Robert Cecil, K.C., for the Borough Councils, urged that the proposal to increase the facilities of competition with the Metropolitan Boroughs in regard to the supply of electric power was not justified by any facts which had come to light since the Act of 1888. He objected to the removal of the veto. Mr. Pelham, having replied generally for the Board of Trade, the Chairman announced that the Committee had agreed to pass the preamble of the Bill, subject to certain modifications of the clauses. These were under consideration when the Committee adjourned.

On the resumption of the proceedings yesterday, Mr. Hutchinson, representing the Gas Companies Protection Association, said he did not intend to move an amendment he had already put in. He proposed, with the Committee's permission, to bring up a general protective clause later on. The Chairman said the Committee had considered the position of the Gas Companies, and were quite prepared to put in a protective clause; and they would be glad if Mr. Pelham and they would agree on a clause. The Committee thought the Companies should have one. It was agreed, after a question by Mr. Pelham as to the effect of the clause, which the Chairman said should be on the lines of the amendment put in, that the agreed clause should come up later.

International Gas Exhibition, Earl's Court.—We regret to find that, in the list supplied to us for publication last week, of the firms who have so far taken space for the forthcoming Earl's Court Gas Exhibition, the name of the Richmond Gas Stove and Meter Company was omitted. As a matter of fact, the firm have booked a space 30 feet by 40 feet, and were the first to do so.

Darlington Gas Supply.—At last week's meeting of the Darlington Town Council, Alderman Barron moved the adoption of the Gas Committee's report, which showed a net profit for the year of £9903, against £9944 in the previous year, although the price of gas had been reduced. Mr. Starmer urged that the price should be reduced further, seeing that there was a good profit; but Alderman Barron said it was supplied at fair market value, and as the profit was used to reduce the rates, the town had the advantage of it. The report was adopted.

LEGAL INTELLIGENCE.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

Tuesday, July 5.

(*Before the* MASTER OF THE ROLLS *and Lord Justice* STIRLING.)

South-West Suburban Water-Works Company v. St. Marylebone Guardians.

This appeal, of which notice had been given by the defendants, against the decision of Mr. Justice Buckley (see "JOURNAL" for March 8, p. 636) with regard to the supply of water to their Industrial Schools, near Southall, only appeared in the paper for leave to withdraw the appeal.

Mr. CUNNINGHAM GLEN, who appeared for the appellants, said they had given notice to the respondents of their desire to abandon the appeal, and had written to them to this effect, enclosing a form of consent to the withdrawal in the usual form, which included the phrase, "terms having been agreed and settled." The respondents signed the consent, but struck out these words; and the officials thereupon declined to strike out the appeal, without the leave of the Court. The only question now was as to the liability of the appellants to pay the costs incurred since the notice of discontinuance.

Mr. G. WALLIS, for the respondents, said the words were struck out because some of the terms, which referred to the supply of water to the schools in future, had not yet been agreed to, though no doubt they would be. He had no objection whatever to the appeal being withdrawn, on his costs being provided for.

After a short discussion, their Lordships held that the appellants must pay the costs, up to and including the present application.

DUBLIN POLICE COURT—Monday, July 4.

(*Before Mr.* DRURY, *Divisional Magistrate.*)

Question as to the Depth of Laying Gas-Mains.

To-day the hearing was resumed of the case which has already been before the Court on May 17 and June 13,* in which the Alliance and Dublin Consumers' Gas Company, acting under authority of their statute of 1866, proceed against the Dublin County Council on summons in consequence of a refusal by the County Surveyor to approve of the Company's proposed method of laying certain new gas-mains in Harold's Cross Road in the suburbs of the city.

Mr. IGNATIUS O'BRIEN, K.C., appeared for the Company; and the County Council were represented by Mr. T. M. HEALY, K.C., M.P.

Mr. *Herbert T. Harris* deposed that his firm had bought up from the Dublin Corporation their 15-ton roller and gave them one weighing 10 tons instead. They found that they could not use heavy rollers, as in many cases cellars ran out under the streets, and the gas-pipes had to be laid rather shallow. In his opinion, the weight of steam-rollers was increasing considerably, and lately the Government had brought over three or four traction engines, each weighing 14½ tons light or 20 tons loaded, for use on the county roads between Dublin and the Curragh Military Camp. The use of traction engines was largely on the increase among farmers, and the ordinary portable engine was fast becoming extinct. The use of these engines, in his opinion, rather improved the roads by consolidating them. He had inspected the road works at Harold's Cross Road and found the re-filling material being put in dry. This was not good engineering in his opinion. It would be better if it had been wet and properly rammed. In Rathmines, where gas-mains were laid they were "pitched" over, or overlaid with a layer of coarse stones not broken to any uniform size. These formed more or less of a protecting arch over the pipes. Of course, the County Council could not adopt the "pitching" process on their roads as was done in Rathmines. Two feet of depth for mains might be sufficient on certain roads where the soil was good; but he would prefer 3 feet in order to be safe, and having regard to future traffic. He had observed that the pipes in this district were weakened by frequent tapping—this occurring sometimes with intervals of only 5 and 6 inches. The only difficulty in putting the mains down 3 feet would be the extra cost.

Cross-examined by Mr. O'BRIEN: Leakage would not be such a material matter in electric as in gas mains. He was at present interested in his employers' firm selling traction engines and steam-rollers. A 15-ton roller was a more profitable thing to sell than a 10-ton roller. An ordinary loaded cart would be more dangerous to underground pipes in proportion to its weight than a traction engine or steam-roller, and would do more harm to the road surface. He would consider it an essential thing for the Gas Company to have the joints of their pipes properly tight; but it might be cheaper to put up with leakages than to lower the pipes to a depth where they would be safe from breakage.

To Mr. DRURY: He disagreed with the evidence of Mr. Herring and Mr. Hunt, that 2 feet was a sufficient depth for gas mains outside towns and where there was no sett pavement.

This closed the evidence.

Mr. HEALY, in summing up the case for the County Council, said it was under circumstances such as had been unfolded in the evidence that they had come into Court for protection against the incessant and clamorous demand made upon them by a voracious and inconsiderate Company. He begged the Court to have regard for the miserable position in which the taxpayers of the county were placed. He submitted that the roads were not safe in the way the Company proposed to relay them. The plan they had submitted was really no plan at all. They said they would lay their mains according to "the usual practice." They had obtained an injunction against the Council in respect of mains laid in accordance with this "usual practice;" and it was in consequence of this that the county were being mulcted in all this ruinous expense that had been going on. Counsel quoted from a judgment of Lord Justice Lindley in an action against the Lambeth Water-Works Company (L. J., 62, Chancery Division), which he said clearly showed that what was required in cases of this kind was not a plan of the proposed works, but a plan showing what they proposed doing "in and with the street." "The object of the plan," said Lord Justice Lopes, "to my mind is this—to give information to the road authority as to the nature and character of the work proposed, not only as to the breaking up and opening of the surface of the road, but as showing and giving information as to what is proposed to be done underground." The Gas Company had absolutely disregarded every point which the County Council regarded as cardinal in the re-filling of the road. The persecution of the Council by the Company was beyond anything he could describe.

Mr. DRURY: Do you suggest that I should reverse the decision of the Master of the Rolls?

Mr. HEALY said he did not. The Master of the Rolls was dealing with old-laid pipes; while his Worship was dealing with new-laid pipes. Counsel relied on the decision of the Master of the Rolls and the Court of Appeal. The Master of the Rolls decided that, as regards existing pipes, they had an interest, because they could not disturb them, and they were under the statute of limitations.

Mr. DRURY: All the breakages that were complained of there were breakages in the old pipes and not in the new ones?

Mr. HEALY: I agree with that. But I am dealing with new layings; and I say, "Are we to have with new layings the same state of things in the future that we have had with regard to old layings?" Really let me put this to you. As between a 10 per cent. money-making Company and a disinterested road authority, to which side ought you to lean? Surely you should take the view of the road authority. We are dealing here only with mains. Allow them to put these down at a depth of 2 feet. What is to be the case with the service-pipes, which are the pipes in connection with which the breakages constantly occur? The service-pipes are bound to come up, and their depth must be less than 2 feet.

Mr. DRURY said, by his Kingstown decision, they were bound not to put the service-pipes up high enough to reduce the amount of the surface to less than 2 feet.

Mr. HEALY said they had actually got their injunction where the service-pipes were showing above the surface of the road. Instead of getting an injunction, the Company, he maintained, should be prosecuted for murdering people with their water gas produced at one-fourth the cost of coal gas. He begged of the Court in the public interest to accede to the moderate demands of the County Council.

Mr. O'BRIEN, in reply, said he would abstain from any observations with regard to Counsel's charges about water gas, and because his Company paid a 10 per cent. dividend. He had yet to learn that this was criminal conduct in a company be it for the supply of water or gas, or for the running of tramways or electric light. The point at issue was a clear one under a section of their Act of Parliament.

Mr. DRURY said the only point he wished to hear Counsel on was the depth that ought to be allowed for this section of mains at Harold's Cross Road.

Mr. O'BRIEN said it was really the Company who were being persecuted in this case, because, in spite of the Kingstown decision, they were being obliged to fight the same question all over again at the same enormous expense. In his view, the question of the service-pipes had nothing to do with this case.

Mr. DRURY said he did not accept this. Counsel might address himself to arguing whether, in the event of his making an order fixing a particular depth, that depth should not govern the services also.

Mr. O'BRIEN said a service-pipe must necessarily be at a less depth than the main. In this particular section, they did not propose to lay service-pipes; and, while not disputing the jurisdiction of the Court, he had not come there to discuss the question of service-pipes, because it had not been raised. The issue was plainly between a depth of 2 feet and a depth of 3 feet. On the one hand, the Chairman had the evidence of the City Engineer, with his forty years' experience, and also of two of the most skilled engineers from across the Channel, stating that 2 feet was quite enough as judged by their own personal experience, and also that, in the view of the profession generally, this depth was ample. As against this, all they had was the evidence of a gentleman who had laid pipes in La Plata and was now an agent for a traction engine company. This testimony could not counterbalance the case he had made; but, more than that, there was the fact that the Rathmines Authorities were satisfied with 2 feet, and that Mr. Collen had also been satisfied with it in other parts of the country. This being the position of the case, he submitted that no reason had been shown why these mains should be put down 3 feet. As to the other matters, they were simply introduced to hide the main issue. The specification and plan sent in by the Company were ample as to how the work would be done; and in case of default, the sections of the Gas Act dealing with penalties and damages gave the Council all the protection they wanted.

Mr. DRURY said he would not put the parties to the trouble of coming back another day. The case before him was a very simple and clear one; and he felt no hesitation in giving his decision at once. He had nothing to do with what was going on in any of the townships or elsewhere, or with the hardship on the County Council or the popularity or otherwise of the Gas Company. The Act of Parliament was very simple. First of all, Was there a proper plan? Mr. Healy said there was not, and that owing to bad workmanship, certain things might happen in case of subsidence and such like. But if it happened, surely there was no Court in the land that would not hold the Company liable for damages. All the deficiencies in the work which Mr. Collen complained of were matters within his own power, because all he had to do was to send his assistants to see that the work was properly done, or make the Company take the consequences,

* See "JOURNAL," Vol. LXXXVI., pp. 518, 971.

Mr. HEALY: If that be so, we will want about twenty more officials in the county.

Mr. DRURY proceeded to take up the requirements of the County Surveyor *seriatim*, and comment on them. It was not the object of the Act of Parliament that a Justice was to decide on a plan whether the refilling was to be done in a particular manner or not, or that the clay should be moistened. It was the business of the Surveyor to see that this was done, if he wanted to; and so also with the other requirements which had been furnished. He had expected Mr. Collen to be present to enlighten him with reference to a point which had not been fully cleared up at the last hearing. The main into which an end of the present section would join had been laid less than two years ago at a depth of 2 feet, and after due notice to the County Council. Mr. Collen was not able to say whether he had objected to this at the time or not.

Mr. HEALY said there was no plan furnished.

Mr. DRURY, continuing, said that in that case he had a right to demand one, and the Company, if they did not furnish a plan, would have been liable to very heavy damages. He was obliged to presume, in the absence of Mr. Collen, that the main had been laid under his superintendence; and now the contention with regard to this little bit of junction pipe was that it must be put down 3 feet. Mr. Collen was not there to explain this. Indeed, there could be no explanation; and it would be rather late now, after two years, to say that the work was all wrong. Mr. Collen had no right to demand that the work should be completed within a month. As to the filling in and subsequent maintenance, it was provided that certain things should be done, or, in default, that penalties would be enforcable. If "pitching" (which had been referred to in the evidence) was a desirable thing, why did not Mr. Collen put that in his requirements. He must assume that a great County Council who did their work admirably, because the roads were a credit to them, had taken legal advice before their requirements were issued, and that they had been served with some ulterior purpose—in fact, Mr. Healy said so, and hinted at future proceedings. And now, coming to the gist of the whole thing—viz., the depth of the pipes—he really did not see what he had to decide there, unless he reversed the decision of the Master of the Rolls and his own judgment in the Kingstown case. In the latter, the evidence of the expert witnesses all through amounted to a concensus of opinion that, no matter how heavy the traffic, a 2-feet depth, properly laid, was sufficient. As against this, all he had was the evidence of Mr. Collen, who did not speak with any practical experience as a gas engineer at all, and of Mr. Harris. The latter was no doubt an able gentleman in his own particular line; but he could not put his evidence and that of Mr. Collen against the evidence of these experts who were constantly lifting and laying gas-pipes, and who held that a 2-feet depth was quite enough, if the laying was properly done. If things were badly done by the Company, the County Surveyor had himself to blame; but he did not assume that Mr. Collen did not see to it. These pipes were not being laid every day, and surely he could get enough assistance to look after the work. There was nothing more to say in the matter. He had not to decide any question of law, but merely on the evidence as to facts; and he decided that 2 feet was a sufficient depth for these pipes, and that he need not give any direction on the subsidiary matters, as to which the County Council were amply protected by Act of Parliament. His order would be that the mains in dispute shall be laid at such a depth, not being less than 2 feet, as shall maintain an exact proportion between the other portions at either end, and he would also add on, "and so that no service-pipe approaching from the said main shall be at a lesser depth than 2 feet."

Mr. O'BRIEN took serious exception to this addition. He was in error when he stated that there was no intention of taking off service-pipes from this main. As a matter of fact, as he was now informed, the service-pipes were already laid, and would only require to be attached. He pointed out, furthermore, that the question of service-pipes was not raised by the summons, and was not discussed during the hearing. None of his witnesses had been asked anything about this; and he submitted that his Worship should not attach this addendum to his order without at least giving an opportunity for re-opening this branch of the case.

Mr. HEALY argued that the full order should go. It was at least a little curb on a Company who conveyed "piped assassination" through their roads and streets.

Mr. DRURY appeared inclined to adhere to the order as made; but after a long and heated altercation between Counsel, it was agreed to let this branch of the case stand over until after the holidays, when Mr. O'Brien could have his expert witnesses back again and re-examine them upon it. It was also agreed that the works might be proceeded with, on the understanding that the Company would remove anything that could be shown to be adverse to his Worship's decision when it was fully made up.

On these terms, the further hearing was adjourned until a day in October to be subsequently fixed.

Prepayment Meter Damaged by a Thief.

The Commercial Gas Company recently had to charge a man named Austin, who had been one of their consumers, with stealing 2d. from a prepayment meter, and further with wilfully damaging the meter. Mr. Young, who prosecuted, said that defendant was heard hammering where the meter was situated; and a neighbour on going to ascertain the cause found the door locked. Subsequently the landlord was sent for, and then accused walked away, but was arrested. He denied taking any money; but the sum of 2d. was found to have been abstracted. Mr. H. G. Smith, one of the Company's collectors, afterwards examined the meter, and found a hole had been made in the money-box, leaving an opening large enough for coins to be passed through. The opening had been made with a poker, which was found sticking in the box. The top of the meter had also been considerably bent. Such an act was extremely reprehensible, as there was a danger of the poker going through the pipe, and thereby causing an escape of gas. Prisoner, who had nothing to say in answer to the charge, was fined 45s., and 5s. the amount of damage, or ten days.

MISCELLANEOUS NEWS.

THE COMMITTEE ON METROPOLITAN GAS TESTING.

ABSTRACT OF THE EVIDENCE.

Tenth Day.—Thursday, March 24.

Dr. CLOWES (continued).

On the resumption of the proceedings to-day, Dr. Clowes attended for further examination by members of the Committee. He was first of all taken in hand by Mr. Moulton, who questioned him closely as to the statement that the gas outside the testing-stations had been found to be different from that dealt with by the examiners inside. Witness admitted that the situations of the testing-stations were deliberately selected by the Referees as being suitable, and that they therefore gave a fair test of the gas as passing along the main at well-chosen places. It did not, however, follow that they gave a fair test of all the gas that left the works, because all the mains were not checked. In the first place, there were not sufficient testing-stations; and besides this the Council did not occupy the position they should as an independent testing authority, because they had to give considerable notice of their intention to test, which rendered it possible for the Companies to more or less adapt their gas to the test. The Council were bound to give 24 hours' notice; but as a matter of fact they gave 48 hours. Mr. King elicited the statement that this notice was never given except when the Companies asked for it; and that two of the Companies had not done so for many years past. Asked by Mr. Moulton whether his suggestion was that, even if notice was given, a gas company could alter their mode of manufacture in 24 hours, so as to make the gas to be tested substantially different, witness replied that his difficulty in the matter was that for very many years they had (by independent tests) found the gas outside the testing-stations different from that inside. He did not think it likely that a gas company could easily alter their mode of manufacture; but it was conceivable that they could have gas of different quality in their holders, and that they could arrange the distribution from those holders. He knew, as a matter of fact, that gas on Sunday had been found—before it was known that it would be officially tested—inferior to that tested in the stations on weekdays; so that there seemed to be some arrangement by which it could vary.

Asked whether he considered that the Companies had any duty beyond satisfying the tests at the prescribed stations, witness said he thought "the intention of the Act was that the consumer who was receiving his supply in a reasonable way should have gas of the quality stated in the statute." Mr. Moulton: "What you want is some test which, I might say, commences after the gas has left these properly chosen testing-stations, to test the effect on the gas of what I might call subsequent circumstances?" Witness: "Yes, as far as the Gas Company are concerned. I think there may be conditions in the smaller part (if I may so term it) of their service which may prejudicially affect the gas. I think that should not be so. I mean, such as they speak of under the term 'dead-ends.' I think that is a wrong thing as far as consumers are concerned." He thought there should be sufficient circulation to prevent the gas from deteriorating; though they had it on the best authority that well-made gas, even under stagnation, did not suffer. He had not made any experiments himself; but he took it from those who knew, that water gas enrichment was the only permanent kind—of course, excluding cannel.

After a long series of questions with regard to the results obtained from tests by the portable photometer, witness said he was perfectly satisfied that this was an absolutely fair method; but if there was any feeling to the contrary, the Council were quite prepared to set their apparatus up in a large furniture van, or something like that, and test from the street-lamps, where the gas came direct from the mains. Passing to other matters, witness said he had not worked with the Wandsworth burner; but it was not a standard burner, nor at all "suitable for use by the consumer." He should be entirely in favour of having one standard burner for every quality of gas.

Professor PERCY F. FRANKLAND.

The next witness to appear on behalf of the London County Council was Professor Percy F. Frankland, who, in his evidence-in-chief, set forth his reasons for opposing any reduction of the illuminating power of gas. He stated that, in order to obtain the same amount of light, the consumer had to burn a larger volume of the poorer gas, with the result that the air was more vitiated with the products of combustion, for which damage the consumer could not be compensated by any money equivalent. This was a matter of much importance, for gas was becoming more and more exclusively the illuminant of the small and generally ill-ventilated rooms of the poorer classes.

As regarded the increased amount of gas which had to be burnt if the illuminating power was reduced from 16 to 14 candles, this would, of course, depend upon the burner employed. Obviously, if the two gases were burnt under the same conditions as in testing, 1143 cubic feet of 14-candle gas would have to be burnt to give the same amount of light as was obtainable per 1000 cubic feet of 16-candle gas, which represented an increased consumption of 14·3 per cent. He had found that, using the best flat-flame burners, specially designed by Mr. Sugg for the most advantageous consumption of 16 and 14 candle gas respectively, 1348 cubic feet of 14·4 candle gas (according to the South Metropolitan test) had to be burnt in order to give the same amount of light as was yielded by 1000 cubic feet of 16·5-candle gas. This represented an increased consumption of 34·8 per cent. With the Welsbach mantle, the highest efficiency obtained by him with the two gases was 22·7 candles per cubic foot of 16-candle, and 20·7 candles per foot of 14-candle gas. From this, it followed that 1097 cubic feet of 14-candle gas would have to be burnt in order to yield the same amount of light as was obtainable from 1000 cubic feet of 16-candle gas—an increased consumption of 9·7 per cent.

With reference to the value for heating purposes, witness had found the calorific power of a cubic foot of 16·3-candle gas to be 628 units gross and 567 units net; while a cubic foot of 14·4-candle gas gave a result of 582 units gross and 529 units net. Thus to obtain the same amount of heat gross, 1079 cubic feet of 14·4-candle gas would have to burnt, against 1000 feet of 16·3-candle gas, or an increased consumption of 7·9 per cent.; while to secure the same quantity of heat net, 1072 cubic feet of 14·4-candle gas would have to be consumed, against 1000 feet of 16·3-candle gas, or an increase of 7·2 per cent.

These figures indicated the proportion in which the value of the gas was diminished, by the reduction in illuminating power from 16 to 14 candles, to the consumer (1) using the gas as in the tesing station, (2) using the best flat-flame burner, (3) using the Welsbach mantle, and (4) using the gas for heating or power purposes. Assuming the present selling price of a 16-candle gas to be 2s. 6d. per 1000 cubic feet, if 14-candle gas were to be supplied to these several classes of consumers without their suffering pecuniary damage, it would have to be sold to argand burner consumers at 2s. 2·2d. per 1000 cubic feet, for flat-flame burners at 1s. 10·2d., for Welsbach mantles at 2s. 3·2d., and for heat and power at 2s. 4d. It had been given in evidence over and over again by the engineers to gas undertakings that the cost of enriching gas from 14 to 16 candles was a little more than ½d. per candle; and it seemed obvious, therefore, that the reduction in illuminating power from 16 to 14 candles admittedly effected only a trifling economy of about 1d. per 1000 cubic feet, while it entailed a loss varying from 2d. to nearly 8d. per 1000 cubic feet to the several classes of consumers, on the basis of 16-candle gas selling at 2s. 6d. It would be seen, moreover, that it was the presumably poorest consumer—the user of the flat-flame burner—who was hardest hit by the change.

Dealing with the portable photometer, witness remarked that, in order to ascertain the value of goods supplied, a purchaser would naturally examine them as delivered, and not at some anterior point of time in their history. So in the case of gas it was of little or no interest to a consumer to know that at the works or at a testing-station it was of the statutory illuminating power; the all-important consideration to him was whether the gas was of the quality "stipulated by agreement" when actually delivered to his premises. That the gas was, in fact, "up to sample" as delivered to the consumer could only be ascertained by the use of a portable photometer. He had heard no reasonable argument against the application of such a test—indeed, for the vendor to object to it was practically admitting that he was being paid for something which he did not supply. The testing should also be performed without notice; but, on the other hand, it would of course be inequitable that the representative of the consumer should be able to make tests upon which forfeitures were dependent without the vendor having an opportunity of checking them. It would be quite easy to devise a system of peripatetic photometry in which this opportunity would be provided.

After touching on the method of testing—as to which he said there was no special virtue in either the constant consumption or constant illumination plan, but that the former was manifestly the simpler—witness proceeded to consider the question of purification from sulphur compounds. That the consumption of gas led to the corrosion of metallic objects by reason of the sulphur which it contains did not, he said, admit of dispute; and a gas containing much sulphur would obviously have a greater effect than one containing less. The abolition or relaxation of the sulphur restrictions would be again most seriously felt by the poorest consumers, with their small ill-ventilated dwelling-rooms and frequent use of the flat-flame burner. It was generally admitted that by abolishing the purification of the gas from sulphur compounds, the average proportion of sulphur would rise to about 30 grains per 100 cubic feet. The meaning of this to the consumer could perhaps be best realized by a consideration of the following concrete case: In a small household, in which two Welsbach burners were constantly used every evening in the sitting-room, and in which three other burners in different parts of the house were alight for shorter periods, he had ascertained that about 20,000 cubic feet of gas were consumed per annum. The 10 grains additional sulphur per 100 feet would be equal to about 0·3 lb. of sulphur, or 0·6 lb. of sulphur dioxide, or 0·9 lb. of concentrated sulphuric acid per annum, superadded to the other impurities in the air of this small dwelling.

Questioned by the Chairman, witness said he did not think the flat-flame burner would be superseded as long as the incandescent burner had its present form. Everybody of his acquaintance was very dissatisfied with the incandescent burner for many purposes. For any practicable flat-flame burner, high-quality gas had a very great advantage. With 16-candle gas, it was possible to obtain a light of 16 candles with a consumption of 5 cubic feet from a flat-flame burner. He had done this himself; but he did not think that these high-duty flat-flame burners were by any means very satisfactory, as they required great stillness of the air. The gas was used at a very low velocity; and if there was any disturbance of the air, the flame was blown about. A calorific test would be very desirable as a supplement to an illuminating power standard, but not in place of it. It would be very difficult to effect a compromise in this matter, and to take a sort of average of heating test and illuminating test (so that, if the illuminating power were somewhat deficient and the heating power was good, the gas might pass), because there were two set of consumers to be satisfied. It would only be with the same make of gas that the heating and illuminating power would go together. For instance, pure coal gas had a different heating value for a given illuminating power from what a mixture of coal gas with carburetted water gas would have for the same illuminating power. It would be very undesirable to change the standard testing burner.

In reply to Mr. King, witness said he thought that for gas of an illuminating power somewhere in the vicinity of that for which the standard burner was constructed, the consumption should be maintained at a uniform rate of 5 cubic feet per hour. Of course, if the gas was of a very high illumiuating power, it would be impossible to burn it at anything like this rate. The Chairman: "When you advocate the testing in the standard burner at the rate of 5 cubic feet an hour in all cases, what is it exactly that you would propose in the case of the two Companies who have got parliamentary sanction to the other method of testing? Do you argue that their gas, which is called 14-candle gas according to the Act of Parliament, should really have been called 13-candle gas, and that in any future Act this correction should be enforced; or do you wish that they should be required to make gas actually a candle better than they now make it under the same conditions in other respects?" Witness: "Well, the South Metropolitan Company undoubtedly obtained statutory power to supply gas of 14 candles according to their method of testing; and it would be going back, of course, upon that Act to make them supply 14-candle gas according to the method of testing to which I have just given the preference. But I should certainly like to see their gas called 13-candle gas instead of 14-candle gas, because it is leading to an immense amount of confusion, and it is not understood by the public at all. It is leading to quite erroneous judgments being given in Parliamentary Committees in which these matters are discussed." Sir William Abney pointed out that there were burners which, burning 5 cubic feet an hour, would give 14 candles with this so-called 14-candle gas; and that therefore there was no injustice in terming it 14-candle gas, although burning it in the standard burner one only obtained 13 candles.

Witness was then taken at great length over the portable photometer question; being closely pressed on various points. First of all the Chairman was particularly anxious to ascertain from him why the tests at the official stations were not considered adequate; and next Mr. Moulton displayed equal pertinacity in the endeavour to find out what failure of duty Dr. Clowes (who had intervened) considered the Gas Companies were guilty of who supplied non-enriched gas which satisfied the tests at the stations but not the portable photometer. Dr. Clowes replied, in effect, that the Companies should be compelled to supply the consumers with the gas which they were required by statute to supply. Exactly what the Companies ought to do beyond supplying the testing-stations with gas of the prescribed power, he was quite unable to say, though persistently urged by Mr. Moulton to do so. Sir William Abney, with regard to a remark by Professor Frankland, pointed out that the Committee had it on record from witnesses that they had not found so much difference between the portable photometer and the illuminating power at the testing-stations, or practically no difference, where 14-candle gas had been used. Witness replied that he was asked what reason he had for advocating the portable photometer now that 14-candle gas without enrichment had been introduced. He was still in favour of the portable photometer, because he saw no reason why the same state of things should not occur with this gas as had been experienced with 16-candle gas. If the Companies were producing gas from the coal of lower than 14 candles, and enriching it to 14 candles, it seemed to him there would be just the same possibility of variations.

As to sulphur, witness expressed the opinion that the amount at present allowed by law was too large, and rendered gas consumption objectionable for many purposes. He had never until recent years heard it questioned that the evil results traced to gas were due to the sulphur in it. Of course, in the matter of combustion, the sulphuretted hydrogen did no more and no less harm than the combustion of the same amount of sulphur in the condition of sulphur compounds. But the great objection to sulphuretted hydrogen was its action on brass fittings. It led the taps to leak, which was one of his great reasons for not using gas in his own house—the almost impossibility of getting gas-tight fittings. Any latitude in the matter of sulphuretted hydrogen would tend to increase the leakiness of the fittings; and his impression was that this leakage of unburnt gas was dangerous to health. Mr. Vernon Harcourt had spoken of allowing 1 grain of sulphur in the form of sulphuretted hydrogen; but there was no necessity for it to be there. It could easily be removed; and he (witness) would, as a consumer, certainly rather not have it in the gas. As to the spent lime nuisance, there were other means of removing the sulphur compounds—not as yet with the same degree of certainty that lime did, but still the greater portion could be taken out by scrubbing the gas with ammoniacal liquor to which sulphur had been added. This was a process that was now being developed by the British Cyanide Company. It was being put into operation at Swan Village (Birmingham), Walsall, West Bromwich, Leamington, and a number of other places on a large experimental scale. Asked whether the undertakings referred to dispensed with lime altogether, witness said that possibly in some cases they would not be using lime even now; but in most instances where they did use lime, they would not substitute the new method entirely, because it did not give absolutely reliable results. It might remove a large proportion at one time and not at another; but at any rate it would very much mitigate the nuisance occasioned by lime purification, because less lime would have to be used. Witness said that it was so difficult to prove injury to health by the sulphur products of gas present in the air, that he should not be prepared to pass a definite opinion on the subject. Sir William Abney remarked that he could quite understand the Gas Companies wishing to get rid of the sulphur clauses, to avoid the nuisance that was occasioned by them. It was not a question of cost in money, but of gain in a different kind of way—popularity, and so on.

Mr. Isaac Carr.

The Engineer and General Manager of the Widnes Corporation Gas and Water Works, Mr. Isaac Carr, who next presented himself before the Committee, stated that he also appeared on behalf of the London County Council. He commenced his evidence by referring to the low price charged at that town, and to the fact that he supplied gas of over 17-candle power, though the statutory requirement was about 14 candles. The reason he did this was that he was of opinion that it was much more to the advantage of the consumer to have gas of 17 than of 16 candles, and of 16 than of 14 or 13 candles. Had the present low price at Widnes been obtained at the expense of the quality, the consumer could not have been said to be the gainer.

Alluding to the proposals of the Crystal Palace Bill of last year, witness said that he, in conjunction with Professor Frankland and Mr. C. R. Bellamy, made a careful investigation of the effect the proposed alterations would have had upon the consumers. It was desired to reduce the illuminating power by 2 candles—from 15 to 13—and to

alter the method of testing by changing the rate of consumption from 5 cubic feet per hour to such as would yield in a Sugg No. 1 "London" argand burner the maximum light. The words "maximum light" were, however, subsequently struck out, and "16-candle light" substituted, and the 6-inch chimney was altered to a 5-inch one. If these proposed changes in the method of testing had become law, in conjunction with the 2-candle reduction, the effect in reality would have been to lower the illuminating power of the gas by 5¼ candles, and consequently to inflict a great injustice upon the consumers, for which the concession of 1d. per 1000 cubic feet would only in a very small measure compensate. He had most carefully investigated this matter by burning gas of 15-candle power, as at present supplied by the Company, in the special flat-flame burner said to be suitable in all respects for the consumption of 14-candle gas as supplied by the South Metropolitan Gas Company, when he found the highest efficiency duty to be 2·5 candles per cubic foot. He afterwards made a gas equal to 13 candles when the method of testing was that described in the Bill—namely, in a Sugg No. 1 "London" argand burner, table photometer, pentane standard, and 5-inch chimney, with the gas burnt at such a rate as to yield the 16-candle light. Again the South Metropolitan batswing burner was tested with this gas, when the efficiency duty in candles per cubic foot was found to be about 1·5, or a falling off of 40 per cent. in light when burnt under conditions which were applicable to the general body of the consumers. This same gas when tested under the conditions of the existing statutory test, was equal only to 9·7 candles, thus showing a total reduction from the 15-candle standard of 5¼ candles. Tests of the calorific value of the two gases indicated a falling off of 15·4 per cent.; while there was a drop in efficiency of 18·3 per cent. when consumed by means of incandescent burners. The value to the consumer of each candle of illumination was usually found by dividing the price per 1000 cubic feet by the candle power. On this assumption, for each candle of reduction the consumer of 15-candle gas at 2s. 7d. per 1000 feet should have been allowed (say) 2d.

It had, however, been found that the light obtainable from different grades of gas was not proportional to the normal candle power. Thus in London, with 16-candle gas, the light secured with the best type of ordinary flat-flame burner was 2·86 candles, as compared with the 4 candles per cubic foot which the same burner would give with 20-candle gas—or a falling off of 40 per cent. With 15-candle gas, 2·5 candles per cubic foot was the efficiency duty; while with 14-candle gas the duty was 2·32 candles per foot (or 18 per cent. less than 16-candle gas), and of actual 13-candle gas 2·1. With the so-called 13-candle gas suggested in the Crystal Palace Bill—which was, as had been shown, but 9·7 candles—the efficiency duty was 1·5 candles per cubic foot; and it would develop but 60 per cent. of the light given by 15-candle gas, for which 1s. 0·4d., instead of 1d. per 1000 cubic feet, should be allowed to the consumer. In other words, had this measure become law the consumer using the special flat-flame type of burner mentioned in the Bill would have required to burn 40 per cent. more gas to obtain the same amount of light as at present, for which he was to be allowed but 1d. per 1000 feet. The cost of enrichment to the Company did not bear a proportionate relation to the loss sustained by the consumer in the reduction of quality. While the Company might keep up the quality from 13 to 15 candles at an additional cost of ⅓d. to ⅔d. per candle per 1000 cubic feet, the loss to the consumer by reducing the quality from 15 to 13 candles for lighting with the flat-flame burner was 2½d. per candle.

The method of testing should remain on the hitherto adopted system of burning at the rate of 5 cubic feet per hour, as an undue advantage was obtained by the Company when testing 13 or 14 candle gas by burning in a larger volume so as to raise the actual quantity of light emitted by the flame to 16 candles. The alteration was equivalent to burning gas in an improved burner, and for which no compensation of a corresponding value was given to the consumers. Witness had investigated the travelling property of gas enriched with benzol by means of the portable photometer in the Widnes district; and under the circumstances existing there he had found that (though some of the gas had to travel 6 miles and some 2½ miles after enrichment before reaching the portable photometer) at no time was the result shown by the portable photometer more than half a candle less than the maximum result obtained on testing at the works. At times, the tests on both photometers were practically identical; the mean difference over five days' tests being to indicate a loss of about one-third of a candle.

As bearing on his remarks with regard to the cost of enrichment, witness pointed out that during the last two years, while the South Metropolitan and Commercial Gas Companies had been supplying a low-grade gas, the cost of the raw materials for manufacturing same had been but little less than that of the Gaslight and Coke Company for making 16 candle gas. This showed that the higher illuminating power, which was so valuable to the consumer, could be provided by the gas company at a small cost comparable with the loss the reduction inflicted on the consumer. The manufacturing costs at Widnes and many other towns were so much less than those of the Metropolitan Companies, that it seemed the latter must have some means of reducing their figures other than by lowering the illuminating power.

He submitted the following results of tests of the effect of pressure on the South Metropolitan Company's special flat-flame burner of the governed and ungoverned type, as showing that, while the rate of consumption of the governed burner remained practically unaffected by increased pressure, that of the ungoverned burner rose 200 per cent.

Pressure. Inches.	Consumption Governed Burner. Cubic Feet.	Ungoverned Burner. Cubic Feet.
1·0 ..	5·0 ..	3·3
1·5 ..	5·1 ..	4·7
2·0 ..	5·5 ..	6 6
3·0 ..	5·6 ..	9·2

Witness thought it desirable that the limitations as to the amount of sulphur impurities other than sulphuretted hydrogen in the gas should be retained in force. To keep the sulphur compounds within the statutory limits presented no difficulty, and inflicted very little expense on the management of a gas-works. With modern methods of purification, it was not a hardship on any gas authority having the requisite plant to comply with the statutory conditions. To keep the gas free from sulphuretted hydrogen, under the test prescribed by the Referees, presented no difficulty in a works equipped with purifying plant of sufficient capacity, and fitted with valves that were sound. He had found in practice that whenever a slight trace of sulphuretted hydrogen had been indicated, its presence was more frequently due to small defects in valves rather than to any difficulty of wholly absorbing the impurity by the purifying material.

Mr. King first of all examined witness on various points. With regard to enrichment, Mr. Carr said that he had on many occasions made experiments as to the permanency of gas enriched by means of cannel, by testing the gas so enriched at long distances from the works, and also by keeping it stored in a separate holder for a number of days and making daily tests. As a result, he had found no appreciable fall in illuminating power. The general experience of enrichment of coal gas by means of carburetted water gas was that it was equal to cannel enrichment for permanency. The cost of such enrichment in London should not exceed ½d. per candle per 1000 cubic feet, at the current prices of oil and cannel. The cheapest form of enrichment at present was benzol; but this had been found to be less permanent. Witness said his experience of the portable photometer was reliable; and in support of this view he referred to some experiments made by him a few years ago when engaged by the Toxteth Urban District Council to test the gas supplied by the Liverpool Gas Company, and where he never found the gas below the standard. Mr. King thereupon put the following question: "If you are so much in favour of supplying a high-quality gas, and if you think the portable photometer is a reliable instrument, and also that a room very carefully fitted up as a fixed testing-place is desirable, how is it that a large number of tests of the Widnes gas made [not with a portable photometer, but in a room fitted up with the greatest care and accuracy] in the year 1899 showed an illuminating power, in the batswing burner which you say gave 16 candles, of 13·3 candles on the average; that a large number of tests made in the year 1900 gave an average of 14·69 candles; and that a large number of tests made in the year 1901 gave an average illuminating power of 14·38 candles?" Witness replied that he had no knowledge whatever of the tests, and did not choose to say anything about them.

A long examination followed upon the methods of testing, purifying, &c., in use at Widnes, and also with regard to witness's contention that the sulphur compounds other than sulphuretted hydrogen should be limited. Asked whether there was anything he would like to add to his evidence, he said he should like to emphasize his point about the lowering of the quality of the gas. It was suggested, he understood, in the Crystal Palace Bill of this year to reduce the quality to 12 candles; and he did not quite know how the Company proposed to do this. If, however, this low-grade gas was obtained by carbonizing at a higher temperature, it might tend to increase the amount of sulphur; so that if the restrictions were abolished, the sulphur might increase to considerably over what it now ordinarily was with oxide purification. With regard to the question of nuisance, he understood that at the Beckton works (although they were not surrounded by built-upon property), from an economic point of view they re-burnt their spent lime and used it over again for purification. He thought the Commercial and Sheffield Companies were also doing the same thing. In answer to Sir William Abney, he admitted that this would not obviate the nuisance caused by the opening of the purifiers.

Eleventh Day.—Monday, March 28.

Mr. C. R. Bellamy.

To-day further evidence was tendered on behalf of the London County Council; the first witness being Mr. C. R. Bellamy, the City Lighting Engineer, Gas Examiner, and Official Inspector of Gas-Meters to the Liverpool Corporation, who divided his statement under three heads—(1) Illuminating power, (2) method of testing, and (3) the effect of alterations in the above on the standard price.

On the first point, he said the assumption that the incandescent burner was not seriously affected by a reduction of candle power was quite erroneous; while it was equally wrong to infer that the use of gas for cooking, heating, or power was not adversely affected under similar conditions. The price of all gas enriching material was never lower than at present; and though it was admitted that enrichment could be carried out at a cost of ½d. per candle, it was proposed to do away with it now, in spite of the fact that it was years ago introduced and defended when it cost 2½d. per candle. The proposal was a retrograde one; and notwithstanding the different uses to which gas was now put as compared with years ago, enrichment was still desirable. Having regard to its lower cost, it should, in fact, be carried to a higher point than formerly. Taking a perfectly safe figure, it might be said that 50 per cent. of the gas supplied to the Metropolis was used for lighting purposes through flat-flame burners; so that as to one-half of the total consumption the requirement had not changed since the time of the introduction of enrichment. Assuming that the other half of the supply was used for power, heating, cooking, or incandescent lighting, for all these purposes the calorific power largely governed its usefulness. It was constantly claimed that illuminating power had no fixed relation to calorific value; and this might in a measure be true in comparing different districts with a varying coal supply and under different forms of enrichment. But under comparable conditions, there was an undoubted and marked relationship between the two; and it became at once obvious that the only consideration in deciding whether the standard of illumination should be reduced in connection with this form of user was whether the cost of enrichment was more or less than its value to the consumer. Recent research work went to show that the fall of calorific value for each reduction of a candle power was about 3½ per cent.; and no one would argue that the cost of enrichment was equivalent to this. Therefore, it was of the first importance that the Committee should definitely decide: (1) As to the reliable methods of enrichment; (2) as to their cost; (3) the value of this enrichment for lighting purposes with flat-flame burners forming half the total supply; and (4) the value to the consumer for power, heating, cooking, and with the incandescent burner. He thought the determination of

these questions would satisfy them that the economic candle power of the gas supply of any town was not 14 or 16, but much higher.

To prove the soundness of this contention, Mr. Bellamy made some comparisons between the 13-candle gas of South London and the 20-candle gas of Liverpool. The former, used in the best flat-flame burner available (that supplied by the South Metropolitan Company), under the best conditions, would yield 2·1 candles per cubic foot; while the same burner with Liverpool gas would yield 4 candles, or nearly twice the light. Therefore, if the South London gas was enriched from 13 to 20 candles, practically only half the quantity would be required by the flat-flame consumer, who would thus save half of his gas bill, or (say) 1s. per 1000 cubic feet; but he would have to pay out of this the cost of the enrichment, which would be about 3½d. In case, however, this was queried, or to meet the argument that with general enrichment the price of enriching material would advance, he would put the cost at ¾d. per candle, or 5¼d. per 1000 cubic feet for the 7 candles—showing a saving of about 7d. per 1000 feet to the consumer with flat-flame burners. Then, again, with 13-candle South London gas the Welsbach incandescent "C" burner would yield 7 candles per foot; while the same burner with Liverpool 20-candle gas would yield 22 candles per foot. Therefore the latter was worth 29 per cent. more for incandescent lighting than the former. As 29 per cent. of 2s. 1d. was 7½d., there would be a net gain to the consumer with incandescent burners, after paying 5¼d. for the 7 candles of enrichment to 20 candles, of 2d. per 1000 cubic feet. For power, cooking, or heating purposes, the calorific value of the gas was the important consideration; and he was quite in agreement with the figures recently published by Professor Lewes as to the respective values of 13 and 20 candle gas. The 13-candle gas of South London yielded 560 B.T.U. per foot; while the 20-candle gas of Liverpool yielded 712 B.T.U. Therefore the latter had a calorific value 27 per cent. greater than the former. As 27 per cent. of 2s. 1d. equalled 7d., each candle of enrichment between 13 and 20 would be worth 1d. to the consumer for power, heating, and cooking, or 7d. per 1000 cubic feet in all, against the cost of 5¼d. for enrichment.

With regard to the method of testing, witness thought that the Sugg No. 1 "London" argand with a fixed consumption of 5 cubic feet per hour should be adhered to. As to the time and place of testing, no plan could be satisfactory which did not inspire public respect; and there must always be a feeling of honest doubt respecting tests made in fixed positions under notice to the gas company. The best way would be to give to competent gas examiners the freedom which was allowed to inspectors under the Sales of Food and Drugs Act—namely, to test where and when they liked without notice. He said that in 1895 the Liverpool Gas Company were approached in this matter, and it was agreed —"That the Corporation shall not require the Company to provide any additional testing-places under the Company's Act of 1865 or take any steps to have official tests made under that Act, but that the Gas Examiner of the Corporation may, from time to time, send to the Gas Company a record of the result of tests made by him by means of a portable photometer; and that if those tests show that the gas at the time and place of testing was under the standard power of purity, then the Directors undertake to thoroughly investigate the matter, and use every endeavour (if they find reason to think that the tests were correct) to remedy the defect for the future." Tests were made at the station of the Corporation on a box photometer, and those on the district by means of a Dibdin's portable photometer at various Corporation establishments covering the whole area of the city. His nine years' experience of this method prompted him to recommend it to the Committee for adoption in the Metropolis.

Referring to witness's advocacy of the economical advantages of high-grade gas, the Chairman asked him whether he could explain at all what had led important Companies in London to take the other view. Witness replied that he failed to see any good ground for making the suggestion that the illuminating power of the London gas should be reduced. In the course of further questioning, it transpired that witness had not made his test of what he termed "13-candle gas" in the South Metropolitan Company's district, but at Widnes, where it was specially prepared for the purpose. He called the South Metropolitan gas 13-candle gas, because if tested with the standard tests of the country it was 13-candle gas. Even if the number and position of the testing-stations were to be agreed, if there were an adequate number, and if the testing took place whenever the municipal authority desired, that would not satisfy him; he would want liberty to test when and where he liked. Assuming that a gas company satisfied the statutory tests, he was unable to say specifically what further they should do. They should, however, send out a permanently enriched gas that would test to a standard over any portion of the area of supply. If they did this, they would have no object in limiting the testing to fixed positions. If there was a competent examiner, it would be quite fair to test the gas in a place over which the company had no control, because the efficiency of the service did not affect the matter. He disagreed with Professor Lewes's evidence entirely on this point. He had tested on the dead-end of a main; and there was no variation between a test there and one in the centre of the city.

Mr. H. E. Haward.

The next witness was Mr. H. E. Haward, the Comptroller of the London County Council, who stated that the object of his evidence would be to show the relation which now existed under the sliding-scale between the standard prices of the Companies and their statutory obligations as regarded illuminating power and purity. Under the sliding-scale, consumers were in a sense partners in the undertakings of the Gas Companies; and thus any change in the conditions under which these concerns were carried on affected both partners. It was therefore of great importance to the public, from a financial point of view, that the origin and development of the existing arrangements between the Companies and their consumers should be clearly before the Committee. He therefore proposed to set out shortly the financial history which led up to the establishing of the principle of the sliding-scale of price and dividend, and of the alterations which had been made in the standard prices of the three Metropolitan Gas Companies by the legislation of the last few years.

Mr. Haward then proceeded to give, in the way of history, a sketch of the statutory position of the Companies prior to the legislation of 1875-6 fixing their present powers of charge; the events leading to the legislation of those years; the sliding-scale arrangements of the same period; the Select Committee of 1899; the existing sliding-scale arrangements. He then drew attention to the general considerations affecting the standard price, and observations arising out of Sir George Livesey's evidence. Into the historical portion of the statement, we cannot go; but the following is a *résumé* of the remaining two sections of witness's evidence in chief.

With regard to the general conditions affecting the standard price, it was pointed out that the broad principle adopted in 1875-6 in fixing the standard prices was to be such a figure as would in normal years allow a Company to earn the 10 per cent. dividend; and that the measure of the variation which should be made in the standard price in respect of any change in the conditions affecting the relations of a Company and their consumers, as governed by the sliding-scale, was the amount of the saving which the Company would, by such change, be enabled to effect, or, on the other hand, the expense to which the Company would be put. The Companies had not hitherto claimed to be entitled to derive any direct benefit under the sliding-scale from the reduction of illuminating power; and, in the same way, they could not claim to derive any direct financial advantage from the relaxation of the existing requirements as regarded purity and methods of testing. Any relaxation should be accompanied by such a reduction of the standard price as would deprive the Company of the ability to distribute an increased dividend in consequence of the saving effected. Although under the sliding-scale it would not be just to seek to reduce the standard price to a greater extent than was warranted by the saving which could be effected in consequence of any change, nevertheless it might happen that even the full reduction of the standard price on this basis would not compensate the consumer. It was possible that, although the Company saved only 1d. per candle per 1000 cubic feet by supplying 14 instead of 16 candle gas, nevertheless the consumer lost more by burning the lower grade gas, owing to the greater quantity which (it was stated) had to be burnt to produce the same amount of light, than he saved in the reduced price.

Coming to the next matter, witness said that Sir George Livesey in his evidence referred to the fact that, whereas the South Metropolitan Company gave up 1d. per candle in 1900, they had only effected a saving of ½d. per candle in consequence of the reduction of the illuminating power. He observed, however, that Sir George, in giving evidence before the House of Commons Committee on the South Shields Company's Bill (which proposed to reduce the illuminating power of the gas supplied by the Company from 16 to 14 candles), stated that in his opinion it would be wise of the Company to offer to give the public the full advantage in the actual reduction of the selling price of gas, and to reduce their initial price so that they should not get an increase in dividend; and, further, that they should agree to a reduction of 2d.—*i.e.*, 1d. per candle in the initial price. Later in the proceedings on the Bill, it was claimed by Counsel for the Company, but disputed by Counsel for the opponents, that this suggested 2d. included an allowance for the abolition of the sulphur test, the value of which had been put by other witnesses on behalf of the Company at ½d. If this were so, Sir George suggested a reduction of 1½d. in the standard price for the reduction of 2 candles in illuminating power. The Committee made a reduction of 3d., but stated that they did not wish it to be regarded as a precedent.

Witness said he did not agree with Sir George's contention that the result had proved the mistake in the view of the London County Council in 1900 that a reduction of the illuminating power would cause loss to the consumers. Sir George based his argument on the fact that the quantity of gas sold by the Company had not increased in more than the usual ratio. But this did not disprove the Council's point; for, as was well known, the South Metropolitan Company had by their action greatly increased the use of incandescent mantles, and the adoption of this form of lighting resulted at first in a reduction in the quantity of gas consumed. Moreover, the weather and other causes affected the quantity of gas used. Throughout the greater part of South London incandescent mantles had been substituted for flat-flame burners for public street lighting, mainly at the instigation of the Company. Then Sir George had stated that one-half of the gas supplied was used for cooking, heating, and other purposes for which the calorific value was of importance; and if a reduction of illuminating power led, as was stated by other witnesses, to a reduction of calorific value, it was important to ascertain whether the reduction in the standard price sufficiently compensated the consumer for this loss.

Later on, Sir George referred to the attempt of the London County Council last year to reduce the Gaslight and Coke Company's standard from 16 to 14 candles; but the inference drawn—*i.e.*, that the Council agreed with that reduction—was not justified. The Council only introduced the provision into the Bill as part of a general scheme for dealing with the Gaslight and Coke Company, so as to secure uniformity with the other two Metropolitan Companies; and this provision was dropped when it was found that the Company objected to the change, partly on the grounds on which the Council had objected to a change in 1900. It was not the fact that the Council's proposal to reduce the illuminating power of the Gaslight and Coke Company's gas from 16 to 14 candles was defeated because of the proposal with which it was coupled—namely, to reduce the standard price.

Again, Sir George disputed that gas companies' shareholders received large dividends. It was true that share capital which had been issued since 1876 under the auction clauses had been sold to the public at the current market price; but of the South Metropolitan Company's ordinary capital of £2,865,000 (exclusive of the amount added on conversion), £1,464,000, or (say) 50 per cent., was raised before that year, and on this the Company were now paying a dividend at the rate of £13 6s. 8d. per cent.

Witness said he did not agree with Sir George's statement that a reduction of the standard price did not necessarily benefit the consumer. It was true that a reduction of 1d. in the standard price would not be sufficient to reduce the selling price by 1d.; but, on the other hand, this was no reason why the shareholders should continue to receive

dividends on the basis of the higher standard price, and, in any event, the reduction in the standard price did *pro tanto* benefit the consumer by increasing the surplus available from time to time for reduction of the selling price.

Sir George, in his evidence, made it a matter of complaint that the price of gas had not been greatly reduced since 1889, and that consequently the Company's dividend had not increased. It did not appear to witness that the Company had anything to complain of about the dividend he had mentioned. The object with which the sliding-scale was established in 1876 was to give the Company an incentive to economy, by holding out the possibility of a dividend higher than 10 per cent.; but it could not, he thought, be said that it was contemplated that the Company should receive an ever-increasing dividend.

In conclusion, witness remarked that the South Metropolitan Company did not complain before the Select Committee of 1899 that the restrictions imposed on them and the requirements of the law as to illuminating power and purity were burdensome.

Questioned by the Chairman, witness said his view was that if there was any alteration in the illuminating power, or in the conditions under which the gas was tested, the consumers ought to have the full benefit in a reduction of the standard price. He did not see why the Company were entitled, on any ground whatever, to share in the benefit arising from a reduction of the illuminating power from 16 to 14 candles, or from 14 to 12 candles. It was a matter for the consumer; and very important questions arose as to whether the consumer was well off with 12-candle gas. The mere reduction of the standard price by 2d. or 3d. might not compensate the consumer for having his gas of a low illuminating power. The technical advisers of the Council considered that a consumer was not recouped for having to put up with a 14-candle gas by a reduction in the standard price equivalent to that which had been made by the South Metropolitan Company. It might very well be that this reduction represented really what the undertaking was saved by having to supply only 14-candle gas instead of 16; but it did not follow that the consumer might not suffer by having his gas of a less illuminating power, because he burnt more gas than he otherwise would do. He thought the South Metropolitan Company got very good terms from Parliament, especially if they were allowed to continue their present form of testing. It certainly was not at the time understood by the Council, as representing the public, that this particular form of testing really would allow the South Metropolitan Company to furnish gas of 15-candle power.

Mr. Moulton said that the more he thought of it, the more difficult he found the determination of what conditions were fair between the Company and the public when a reduction of illuminating power was allowed. He asked witness what he thought was fair. Witness replied that they ought to take off the standard price the equivalent of one-seventh of the annual saving effected. This was what he understood had been done, as nearly as could be estimated, by the Act of 1900. He wanted to eliminate from the benefit conferred on the undertaking all that would under the sliding-scale go automatically to the shareholders, and give it to the consumers. But even then the consumer might still be worse off (through no fault of the Company) by having only 14-candle gas, if he had to burn one-seventh more. With regard to the terms put upon the South Metropolitan Company, in witness's view they were fair, subject to this—that perhaps the change to a lower illuminating power was a bad policy for the public. Speaking generally, he thought the principle of the sliding-scale was adequate to keep the position of the Gas Companies *vis-a-vis* of the public a fair one, in spite of the radical changes that might be effected by the increased use of incandescent lighting and the use of gas for cooking and heating. The precise figure at which the standard price should be fixed needed, however, to be revised from time to time. A lower standard price, with the Company entitled to a larger proportion of any savings, would be a greater incentive to economy.

Twelfth Day.—Monday, April 18.

Mr. Charles Carpenter.

With praiseworthy brevity, Mr. Carpenter traced the history of affairs photometrical from the time the South Metropolitan Gas Company first came under the Gas Referees in 1869 (at which date the parliamentary standard of illuminating power was raised from 12 to 14 candles, and so continuing until 1876, when it was increased to 16 candles) down to the present time. He pointed out that it was in 1883 that the Referees began to alter and improve the photometer; and constant changes and alterations were thereafter prescribed by them. He also called attention to the paper read by Mr. Methven before the Southern Association on Nov. 14, 1889; and, quoting from the "Reports of District Associations" for that year (p. 391), he brought to mind the statement of Mr. Frank Livesey that he had been informed by one of the Referees that the improved form of photometer probably gave a lower result to the extent of 1 candle than the old form. Following up the history of the matter, witness told how continued dissatisfaction of the Gas Companies resulted in the appointment, by the Board of Trade, of a Committee in 1891 to inquire into, and report upon, the subject of the standards to be used for testing illuminating power, and how there was an interview between a deputation from the Institution of Gas Engineers and the Gas Institute on the matter in 1893. At that interview, Mr. Charles Hunt explained the views of the two Institutions. One of his statements was that, by keeping to the 5 feet rate for all qualities of gas, these were not tested under uniform conditions—that was to say, 12, 13, and 14 candle gas were tested under adverse conditions, compared with 16 or 17 candle gas. This brought witness to quote the memorable remarks, from the "Reports of District Gas Associations," of Mr. A. G. Vernon Harcourt in the course of the adjourned discussion on Mr. Methven's paper at the meeting of the Southern District Association in 1890 [see Sir George Livesey's evidence]. Then Mr. Carpenter brought to mind the words of Mr. Dibdin, in his book on "Practical Photometry" (1889): "There is no reason beyond the Act of Parliament why one standard argand burner should not be adopted for all gases, and that sufficient gas should be consumed to produce a given height of flame, which having been tested as to its illuminating power, should form a basis of calculation as to the quality of the gas. At the time Mr. Dibdin wrote this, he was Chief Gas Examiner and Chemist to the London County Council. In their 1900 Bill, the South Metropolitan Company incorporated this method of testing the illuminating quality of the 14-candle gas. At the hearing in May, the witnesses for the London County Council were Mr. Dibdin, Dr. Clowes, Dr. Percy Frankland, Mr. Otto Hehner, Mr. Bellamy, and Mr. Fairley; but not one of them urged a single objection to this method of testing. In giving his decision, Mr. Oldroyd said: "The testing for the future will remain on exactly the same basis, and subject to the same rules and authorities as the testing is now." Witness also cited Mr. Harcourt's evidence on the County Council Bill of 1900 for "varying the method of testing the gas supplied to the Metropolis." [The essential extracts will likewise be found in Sir George Livesey's evidence, p. 51.] While on the subject of burners, Mr. Carpenter handed in the copy of a joint report made by himself, Mr. H. E. Jones, and Mr. Charles Hunt, comparing the values of the "London" argand burning gas at the rate of a 16-candle flame and a 14-candle flame, together with two other burners working at this quality:—

> In accordance with the request of Sir George Livesey, Chairman of the South Metropolitan Gas Company, we have undertaken a series of experiments in order to determine whether the existing method of ascertaining the illuminating power of 14-candle gas as prescribed by Parliament in the South Metropolitan Gas Act, 1900, could be revised by using a 14-candle flame as a standard for comparison, instead of a 16-candle flame at present used under the provisions of the Act.
>
> It is well known that the standard "London" argand burner does not develop the light-giving value of the gas when this is consumed therein at such a rate as to give a light of less than 16 candles. Experiments were first of all undertaken in order to ascertain whether this defect could be overcome by substituting a shorter chimney for the standard one of 6 inches; and, for this purpose, photometrical tests were made with a range of chimneys from 4½ inches in length, advancing by ¼ inches to the standard size. With none of these, however, was the proper luminosity of the gas developed, showing that an alteration or modification of the burner was necessary, as well as that of the chimney.
>
> Late last year, a burner was brought under our notice by Mr. W. Grafton, F.C.S. It is a standard "London" argand burner, with two modifications—a 5-inch chimney, instead of a 6-inch, is used, and the central air supply to the burner is reduced in area by a taper bushing-piece, so as to diminish the supply of air to the centre of the flame proportionately to the smaller quantity of incandescent carbon which the 14-candle flame produces. We have made a series of tests (using table photometers) comparing the results obtained with this burner at a distance of 1183 mm. from the photoped (the distance prescribed by the Referees for 14 candles), with the results given with the standard "London" argand burner at the distance of 1265 mm. from the photoped prescribed for 16 candles. We have also experimented with the standard argand burner which is used for testing the 14-candle gas supplied by the Brentford, the Wandsworth, and other gas companies. In order to make the comparison complete, we have included a series of tests made with the standard "London" argand placed at a distance from the photoped of 1183 mm., as proposed by the London County Council in their General Powers Bill.

Distance of Standard from Photoped. Mm.			Candles.
1265	..	Average quality of gas as tested by the method prescribed by Parliament in the South Metropolitan Gas Act, 1900, with the standard "London" argand burning at the rate of 16 candles	14·23
1183	..	Average value given to gas if tested as proposed by London County Council with the same burner burning at the rate of 14 candles . .	13·38
1183	..	Average testings with Grafton's burner burning at the rate of 14 candles	14·57
1183	..	Average of testings using the Brentford and Wandsworth standard burner burning at the rate of 14 candles	15·40

Proceeding, Mr. Carpenter said that there was some disagreement as to the relative use of incandescent and flat-flame burners in England, compared with that on the Continent. In order to set the matter at rest with regard to the district supplied by the South Metropolitan Company, special inquiries had been made in respect of 93,058 of the Company's ordinary, as distinct from the slot, consumers. Out of this total, 69,811, or 75·02 per cent., were found to be using incandescent burners. This brought him to remark that the reduction of the standard of illuminating value from 16 to 14 candles had been a great relief to the anxieties under which the engineers, foremen, and assistants at gas-works in London had been suffering for so many years past. No relief, however, had been given in the matter of the greatest anxiety of all—viz., conforming with the regulations as to purity in respect of sulphuretted hydrogen and sulphur compounds. Witness said he did not think he exaggerated when he stated that, during the years he was in charge of a manufacturing works, a third of his time was taken up in connection with the removal of these impurities. No one who had not been through it could have any idea of the worry and anxiety entailed. He had spent hours and hours on end—day and night—in the testing-room with the testers making colour tests, one after the other, in the vain hope of being able to throw some light upon the irregular working of the purifying-boxes. It was little short of heart-breaking to a progressive gas manager who was doing his best to push the use of gas in the face of very keen, and often unscrupulous,

opposition to find himself handicapped as he was by the existing wasteful methods of dealing with the sulphuretted hydrogen present in the crude gas. In order to convert the ammonia produced in the carbonizing of the coal into a marketable product, it had to be crystallized into sulphate of ammonia. To produce the sulphuric acid necessary for this purpose, the South Metropolitan Gas Company had last year to purchase some 6000 tons of spent oxide of iron produced in gas-works all over the kingdon; while their own sulphur which would have been employed for the purpose was converted into stinking, costly, and useless heaps of "blue billy." The London requirements as to purity had brought purification by means of lime to such a pitch that, at the East Greenwich works of the Company, the purifiers occupied nearly as much space as the retort-houses and the coal-stores. The cost of one set of purifiers was £15,649, or £62,596 for the four. At least half of this cost could have been saved with oxide of iron purification. So, too, with the equally stringent test for sulphuretted hydrogen, 2 grains of which, in 100 cubic feet of gas, would turn lead paper black instantly. Yet the Company and their officers had to submit to all the odium attendant on Police Court prooeedings if the quantity of sulphuretted hydrogen amounted to one part in a million. Neither the Company nor its officers required the application by the County Council's officers of the scourge of these delicate gas testings to make them use their best endeavours for the good of the consumers of gas, without whom they could not live. The trouble caused by the deposition of naphthalene in the consumers' service pipes was immeasurably greater than any inconvenience he could suffer from the presence of all the sulphur compounds or a trace of sulphuretted hydrogen. The Company were indeed the best judges of what the consumer wanted, and what he did not want. Only last year, they spent about £10,000 in improved plant, so as to obviate the discomfort caused by the troublesome naphthalene.

The foregoing is all from Mr. Carpenter's evidence-in-chief. In his examination by the Chairman and other members of the Committee, he once more repeated (with explanations) the reasons which had induced the South Metropolitan Company to reduce their illuminating power—mainly, the abolishing of enrichment, the production of as much gas as possible out of the coal, and the meeting of the extending requirement for a cheaper heating gas. This last point led to some discussion as to the comparative calorific value of the gas of the South Metropolitan Company and of the Gaslight and Coke Company. Witness called to his aid the evidence of Professor Boys that "the South Metropolitan gas was some 5 calories to the cubic foot better than that of the Gaslight and Coke Company, in which there was water gas. The figures roughly were about 150 for the South Metropolitan, and about 145 for the Gaslight and Coke Company." So that, said witness, the fact remained that, taking existing conditions, the South Metropolitan Company were complying with the terms of their Act in sending out gas of 14 candles at the 5·71 feet rate, but the calories as tested by Professor Boys were higher in the case of the South Metropolitan Company than in that of the Gaslight and Coke Company. The former Company, too, had made many tests of their own gas; and they found that the average in British thermal units was 595 gross. In this connection, by request, witness described the new method of testing incandescent mantles; and he mentioned some tests made with the Kröne mantle, for which the Company pay at present 2¼d. each. It was, he stated, a ramie mantle, and was shaped and burnt off under the Buhlmann system. Asked what was the candle unit, with a good mantle, that the South Metropolitan gas would give, Mr. Carpenter replied about 15 candles per cubic foot. It ran higher than this when the mantle was first used—perhaps 18 candles would be nearer, but 15 candles was well within the mark. With the ordinary "C" burner, 15 candles per foot was maintained, in the tests he referred to, for 1800 hours. Reverting to the question of calorific power, witness stated that he had no objection to regular tests being made of the thermal value of the gas supplied to London, if they were not made penal. At present they had no experience of tests for thermal value, year in and year out; and it would be very difficult to reply to the question without some experience in the matter. Lord Rayleigh suggested to witness that thermal tests should be instituted in the future, and continued, perhaps, for two or three years; and that then the question of whether or not a thermal test should be substituted for the illuminating power test should be considered. To this, witness replied that the Company would be very pleased to have these tests made. They would make them themselves, and would have no objection to the results being published; but he reiterated that he should have a strong objection to their being made penal. The Chairman remarked that at present this weighed rather strongly upon his mind—that the illuminating power test was made under rather artificial and impractical conditions. It was made in a burner which was scarcely used at all in practice, and the actual value of the gas seemed to depend firstly upon its calorific value, and secondly upon its value in a flat-flame burner. Witness appreciated this, but observed that the use of the flat-flame burner was diminishing very rapidly.

Witness was taken through the motives (already generally well known) of the South Metropolitan Company for not supplying water gas; and then he was asked questions regarding prices. From his answers, the Committee learned that the existing price of gas in South London is 2s. 1d. At the time the reduction in the illuminating power was made, it was 2s. 8d.; and the standard price was then reduced from 3s. 3d. to 3s. 1d. The selling price of the Gaslight and Coke Company's gas is 3s. "Do you think," asked the Chairman, "that under the present working of the sliding-scale, the Company have an adequate motive for economy and improvement?" Witness answered that this was a difficult question. He thought a much stronger incentive now than the sliding-scale was the fact that they were in very keen competition with the local authorities and companies supplying electricity. He believed the Gaslight and Coke Company suffered the greatest from the competition. In South London, however, they had also a great deal of competition. For instance, the Brush Company were now fitting flats, or they began to fit flats, in Balham with the electric light on the penny-in-the-slot principle. The Gas Company obtained permission to fit up the same flats with incandescent gas-lights, also on the slot principle. In order to make the matter quite clear, the Gas Company hung up in every flat a short statement which told the consumer what he would get in the way of light from a pennyworth of gas, and what he would get from a pennyworth of electricity. He was told the effect of this was that gas was very much more patronized than the electric light. The difference, he added (in answer to another question), was so glaring on the penny basis that the electric light people altered their meters, and put down shilling-in-the-slot ones, and then they explained what the advantages of the electric light were.

Mr. William King produced here an interesting point when he asked whether the higher quality of gas really gave a better result than the lower quality with the incandescent burner? In reply, Mr. Carpenter stated that the South Metropolitan Gas Company had made a good many tests on this matter with various qualities of gas. Taking gas of 16·29 candles, they found that, with the burners and the mantles they were using, they got 65·9 candles, and with gas of 14·73 candles, they obtained 64·2 candles. The 14·73 candles was about the quality of gas the Company had been supplying, under the new Act, for the last eighteen months or so. With gas having no illuminating power that could be read, they realized an illuminating power of 56 candles with an incandescent burner, as compared with 64 candles with 14¾-candle gas. With 11-candle gas they obtained 63·3 candles; and this was the same burner and mantle as were used in the other tests. The only alteration made was the regulation of the air supply. The tests were made from samples of coal gas drawn off at various stages during the process of carbonization at Bankside. The 14·06-candle gas (the nearest obtained to 14 candles) gave, with the incandescent burner, 64·03 candles; and the 16·01-candle gas (the nearest obtained to 16 candles) gave 65·9 candles. The gas in these tests was all burnt at the same rate; and the difference in the illuminating power with an incandescent mantle between the 14 and 16 candle gas was only 1·6 candles.

The testing of the gas was next taken in hand; and witness agreed that if 16-candle gas and 14-candle gas were both burned at the 5 cubic feet rate, the one would come out as 16 and the other 13 candles. But he stated emphatically that he should object to it being called 13-candle gas. If the present name was not satisfactory, then he should say call it, as described in the Company's Act, gas of such a quality that so many feet are required to give an illuminating power of 16 candles. Coming to the question of purity tests, he said that, as to sulphuretted hydrogen, he was pleased to see that the Referees had expressed the view that the stringency of the test should be relaxed. It was very difficult to comply with; and he thought that it would be easy to devise a satisfactory test—either a time test with lead paper, or some modification of the kind suggested by the Harcourt colour test. The Chairman asked if there would be any difficulty in working that test over the same hours that the sulphur test was now made—that was to say over a large number of hours consecutively. The reply of witness was that one would not be sure when he had a fixed tint. The Harcourt test depended upon getting a fixed tint. With a small quantity of gas passing, there might be, so to speak, a *plus* or *minus* tint. Sir William Abney suggested that this difficulty might be dealt with as in photography. They might have a scale and match it afterwards. Witness agreed that this might be done. But mentioning the objections, as they occurred to him, he said the colour was not permanent, it did not last very long, and a test that was shut off on Sunday would not be fit for anything on Monday—unless it could be carried out in the dark. It would be a simple thing to try this. Mr. King introduced a question of the 1871 test. The only objection Mr. Carpenter had to urge against it was that it was not a quantitative test; but he believed it was a thoroughly good and practical one. What he might call the chemical objection was that it did not show what was the quantity of sulphuretted hydrogen present. Assuming (Mr. King put it) that they had a clean paper with the 1871 test, and that this was given twice in twenty-four hours, did witness consider that this would be a sufficient test, showing freedom or otherwise from sulphuretted hydrogen? Witness did think it would be a good practicable test, which would clearly indicate whether or not the gas was contaminated, in the practical sense of the word, with sulphuretted hydrogen. Even one test would suffice. To meet the objection of the double attendance of examiners, Mr. Carpenter said he would undertake to devise a test which would automatically pass so much gas for three minutes at 9 o'clock in the morning and again at 9 o'clock at night time. The sulphur question was again attacked; and the worry, annoyance, and mysteries attaching to it were enlarged upon. The persecution by the County Council in this matter was illustrated by the last case in which the Company were brought up at the Lambeth Police Court for an excess of 0·66 and 0·36 grain above the summer limit of 17 grains. Witness produced tests he had made over a long period to see what would be the number of grains of sulphur they might calculate upon in the event of giving up lime purification. The highest return was 47 grains and the lowest about 30 grains; but about two-thirds of the figures were below 40 grains. He did not think that the gas in any town in the country suffered from the want of sulphur purification; and he firmly believed that the consumers of gas in London would not suffer if sulphur purification were given up. In the case of some of the large municipalities, no attention whatever was paid to the sulphur clauses; and the consumption of gas went on increasing. As he had already stated, the South Metropolitan Company had to buy spent oxide of iron in order to make the sulphuric acid necessary for the manufacture of sulphate of ammonia. The Edinburgh Corporation, for example, had been advertising for tenders for their spent oxide; and the South Metropolitan Company were then getting particulars with a view to making them an offer for it. Now it did seem an anomaly that in London they should have to buy spent oxide from a Corporation such as Edinburgh, while their own sulphur was turned into heaps of evil-smelling material, and so wasted, when it might be profitably used in their own process of manufacture. Another thing was that since Sir George Livesey gave his evidence, they had made a good many examinations of the illuminating value of gas purified with oxide and alternately with lime; so that they got in the two cases the illuminating power of the gas with its carbonic acid, and without. The difference in illuminating power was merely between 0·3 and 0·4 candle. If it were only necessary to take out carbonic acid, they could use lime without

the slightest anxiety or any offence. Careful analysis showed that the quantity of carbonic acid did not exceed 1½ to 2 per cent. Processes had been suggested from time to time with the object of decarbonating the gas liquor, so as to render it able to deal with larger quantities of carbonic acid. This process depended on the fact that the amount of carbonic acid and sulphuretted hydrogen displaced under an increase of temperature was not proportional. When the liquor was heated, the carbonic acid was driven off, and what excess of sulphuretted hydrogen was driven off was retained in a tower, and the liquor was sent back to absorb another quantity of carbonic acid. In all probability, the Company would use this process in all their works. They had it already in one works.

THE PAST YEAR'S WORK AT MANCHESTER.

On Monday of last week, the Gas Committee of the Manchester Corporation held a special meeting for the consideration of the report as to the working of the department for the year ended March 31.

It appears from the report that during the twelve months 458,864 tons of coal and cannel were carbonized, as compared with 448,909 tons in 1902-3. The total quantity of gas sent out from the works was 4,994,236,000 cubic feet, against 4,837,001,000 feet, or an increase of 3·25 per cent., compared with a decrease of 0·69 per cent. in the previous year. The amount of gas produced per ton of coal (10,868 cubic feet) was 90 cubic feet more; while the percentage of unaccounted-for gas was 3·71, against 3·25. In the production of 1,159 730,000 cubic feet of carburetted water gas, 3,682,403 gallons of oil and 22,403 tons of coke was used. The illuminating power of the gas sent out from the works was equivalent to 17·8 candles.

The number of consumers on March 31 was 146,457, of whom 29,753 were outside the city. In the previous year the number was 141,954. Of the increase, 2877 were in the city and 1626 outside. The number of automatic meters in use at the end of the financial year was 44,341, as compared with 41,865 in the previous year, or an increase of 2476. Of these, 2011 were fixed in the city and 465 in the out-townships. The quantity of gas passed through them was 376,014,000 cubic feet, or an increase of 39,793,000 feet, or 10·58 per cent., on the previous year. The meters were inspected once every five weeks; and the total amount collected from them during the year was £52,781. This sum was represented by 12,667,546 pennies, weighing over 113 tons. Of gas cookers and other appliances there were 17,722 fixed, as compared with 12,803 for the year 1902 3. The quantity of gas consumed by cookers and fires was estimated at 280,000,000 cubic feet, or an increase of 8·53 per cent. There had also been fixed 18,755 grillers in connection with prepayment and small ordinary meters. The number of gas-engines in use at the end of March was 1625, as compared with 1520 in the previous year; and the quantity of gas consumed by them was 364,982,000 cubic feet, or an increase of 39,982,000 feet, or 10·95 per cent.

The financial results of the past year's working, as then ascertained, were given in the "JOURNAL" for April 26 (p. 253); and the figures contained in the Committee's report do not differ substantially from those previously published. The income was £743,963, as against £773,926 in the previous year; and the expenditure was £560,278, compared with £551,443. While therefore the reduction of the price of gas as from June last year, and the abolition of stove hire, cost £46,000, about £16,000 was made by additional consumption and improved working results. Coal, cannel, and oil cost £259,366, compared with £277,280 in the previous year. Salaries, wages, and maintenance came to £900 more, and £13,000 more was spent on renewals. The receipts from residual products averaged 5s. 7·96d. per ton, against 5s. 8·46d. for 1902-3. The gross profit on the year's working was £183,685. Of this, £41,418 was paid for interest, and £48,426 was put to the sinking fund. The net profit was therefore £93,841, which has been appropriated as follows: Paid to the city fund, £70,000; extension of carburetted water-gas plant, £1603; extension of chemical works, £86; and placed to contingent fund, £22,152. It will be remembered that a further reduction of 2d. per 1000 cubic feet in the price of gas to ordinary consumers takes effect as from the 24th ult.

The number of public lamps within the city is 15,017, and outside 4014. Of those situated in the city, 3290 have incandescent burners.

The Committee have entered into contracts for the supply of 270,000 tons of coal and cannel during the next twelve months, at prices so much under those paid last year that the saving represents a sum of not less than £9000.

GOOLE GAS AND WATER SUPPLY.

Satisfactory Year's Working—Reduction in the Price of Gas.

At the Meeting of the Goole Urban District Council last Wednesday, the Clerk (Mr. J. W. Johnson) submitted the statement of accounts of the Gas and Water Department for the year ending the 31st of March last. It had been very carefully prepared so as to afford every possible information in regard to the financial position of the joint undertaking. Dealing first with the gas revenue account, the total income was shown to be £12,877, against £11,450 in 1902-3; being an increase of £1427. The gas-rentals increased by £863; the sale of coke brought in £495 more; and the sale of liquor £207 more. There were decreases, however, in other items; tar falling £74, and the gas services account £84. The expenditure in the year 1902-3 amounted to £6243; whereas last year it was £5189, a decrease of £1054. The bulk of this (£640) was for coals; but the repair of works and plant cost £392 less. The gross profits in 1902-3 were £5207; in the past year they were £7688—being £2481 more transferred to the profit and loss account. With regard to the water undertaking, the income last year was £3250, compared with £3242 before; while the expenditure was £874, against £950. The gross profits transferred in 1902-3 were £2291; last year they were £2376—an increase of £85. The gross revenue transferred from the two undertakings was £10,064, against which was charged a sum of £2098; leaving a balance of £7966, which is carried to the balance account. This account shows accumulated net profits amounting to £2832, which the Clerk said the Committee might regard as "actual money in the hands of the Treasurer." This sum is made up of the balance of profits from 1902-3 (£1150), and the net profit for 1903-4 (£1682). From 1893, the amount expended on the two undertakings up to March 31, 1903, was £123,064. Since that date there has been spent on the gas-works £1709, and on the water-works £4854; making altogether £129,627. The amount owing in respect of these works on the 31st of March last was £110,970. In his general remarks on the accounts, the Clerk stated that the Committee could safely rely upon the concern being remunerative and prosperous, and that there was every reason for expecting increased returns on the present basis.

The Committee reported, among other matters, that at their meeting on the 4th inst. the Clerk submitted the annual statement of accounts, and read the comprehensive report prepared by him explanatory thereof, as noticed above. After some consideration, it was resolved that both documents be received and adopted. The Committee expressed their entire appreciation of the financial efforts of the Clerk, and of the general conduct of the works by the Engineer and Manager (Mr. T. E. Franklin). It was decided to vote, out of the accumulated profits, the sum of £832 13s. 3d. in relief of the general district rate, and also to reduce the price of gas to all consumers from 3s. 4d. to 3s. 2d. per 1000 cubic feet, as from the 1st inst. Another resolution was adopted to the effect that the minute passed on the 25th of April last, relating to the reduction of 10 per cent. for gas consumed for motive power, in addition to the existing scale of discounts, should apply to all consumers of not less than 5000 cubic feet in any quarter for trade purposes; this further concession to take effect from the 1st inst. The Committee also resolved to consider the question of dividing the present capital of the gas and water undertakings; and the Clerk, the Engineer and Manager, and the Chairman of the Committee were instructed to report thereon at the next meeting.

The adoption of the various reports and statements before the Council was moved by Mr. Turton, who referred to the able way in which they had been drawn up, and to the gratifying result of the year's work. Mr. Blyth, in seconding the motion, said he was glad the Committee had seen their way to reduce the price of gas. He hoped the time would come when they would have it at 2s. 6d. per 1000 cubic feet. He had very much pleasure in congratulating the Manager upon the result which had been attained. Similar congratulations were, he added, due to the Clerk for having drawn up a balance-sheet which was readable and understandable. He was very pleased to know that the Gas and Water Department was in so sound a financial condition. The reports were adopted. With reference to the compliment paid to Mr. Franklin, it may be mentioned that it was thoroughly deserved, as rather more than a year ago, soon after he entered upon his duties, the financial position was so unsatisfactory that the Committee were contemplating an increase in the charges for gas and water, in order to pay their way.

HINDLEY GAS AND WATER SUPPLY.

The Past Year's Working.

The results of the working of the gas and water undertakings of the Hindley Urban District Council in the financial year just closed have been exceptionally good. This is locally regarded as especially gratifying, in view of the depression in trade. The quantity of coal and cannel carbonized was 6996 tons, against 7286 tons for the preceding year—a decrease of 290 tons. The make of gas was 76,250,200 cubic feet, against 75,053,900 cubic feet before, showing an increase of 1,196,300 cubic feet, or 1·59 per cent. The make per ton of coal and cannel carbonized was 10,924 cubic feet, compared with 10,300 cubic feet for the preceding year. The consumption of gas was 70,489,200 cubic feet, against 67,586,600 cubic feet, or an increase of 2,902,600 cubic feet, equal to 4·28 per cent. The quantity of gas unaccounted for has been reduced from 9·29 to 6·7 per cent. The net profit for the year was £1569 3s. 7d., against £386 15s. for 1902-3. The number of water consumers at the beginning of the year was 4710; at the end, 4827—an increase of 117. The quantity of water received in the township from the Liverpool Corporation was 82,595,000 gallons, against 95,840,000 gallons in the preceding year; showing a decrease of 13,245,000 gallons, or 13·82 per cent.—the result of careful inspection and strict attention to leakages in mains and services. The consumption per head works out at 10 gallons, against 10·24 gallons per diem. There is an adverse balance of £335 3s. 9d., resulting from extraordinary charges, but for which there would have been a small profit. The adverse balance for the preceding year was £600. The Committee and their Engineer and Manager (Mr. H. O. Timmins) may be congratulated on this satisfactory state of things.

THE MUNICIPAL TRADING QUESTION IN EDINBURGH.

Memorandum by Mr. W. R. Herring.

The following is the Memorandum on the above-named subject submitted by Mr. W. R. Herring, the Chief Engineer and Manager, to the Edinburgh and Leith Gas Commissioners, which is now under consideration by a Committee, as mentioned in our "Notes from Scotland" last week.

As there appears to be considerable misunderstanding as to the action of the Commissioners with regard to the above subject, I have ventured to write the following memoranda for the information of the Commissioners.

By clause 71 of the Commissioners' Act of 1888, the following powers

are conferred; and it may be said that they are common to all gas undertakings:—

The Commissioners may purchase, sell, let for hire, and fix, set up, alter, remove, and refix gas meters and fittings, gas engines, stoves, ranges, pipes, and other apparatus and appliances, articles, and things for lighting, motive power, the warming and ventilation of houses and buildings, the cooking of food, and for all other purposes for which gas can or may be used, and may require and take such remuneration in money or such rents and charges for, and make such terms and conditions with respect to, the sale, supply, letting, fixing, setting up, altering, or removing of such meters, fittings, engines, stoves, ranges, pipes and other apparatus and appliances, articles, and things as aforesaid, and for securing their safety and return to the Commissioners, as may be agreed upon between the Commissioners and the person to or for whom the same are sold, supplied, let, fixed, set up, altered, or removed: Provided always that any such meters, fittings, pipes, and other apparatus and appliances for the supply of gas, so far as they are the property of the Commissioners, shall not be subject to distress, poinding, or seizure for rent of the premises where the same may be used, nor to be taken in execution under any process of a court of law or any proceeding in bankruptcy against the persons in whose possession they may be.

The gas supply at this period (1888) may be said to have been a complete monopoly. It is therefore obvious that Parliament fully appreciated the necessity for the suppliers of gas also supplying the apparatus and appliances necessary for its proper use, or they would certainly never have granted monopolists such wide and extensive powers. On the other hand, Parliament does not, as a rule, grant such powers if they do not intend that they shall be exercised, or when they are detrimental to private interests. It is perhaps as well to point out at this stage that the trade are not in any way taking exception in their petition to the Commissioners acting the part of traders, excepting so far as incandescent lighting is concerned, although in their general controversy they appear to be dealing with the whole question.

Excerpt from Traders' Petition.

It seems to us that, at least so far as incandescent goods are concerned, there is little excuse for you entering into further competition with the trade, as there is no line of business so well catered for, and in which the prices are so much cut. Incandescent burners and mantles can be purchased at about 500 shops in Edinburgh and Leith, and we cannot see how three more shops can be much advantage to the public, and we do not think it is your intention to enter into an unfair competition as to prices, therefore we can see no advantage which the public can possibly secure by your opening these shops. In fact, it seems to us the result would be that many traders would find it was no longer to their advantage to keep these goods for sale, and thus, instead of having 500 depôts of supply, the number would be considerably reduced, causing inconvenience to the public and unpopularizing this form of lighting.

For years past the Commissioners have had four shops or depôts—one in Waterloo Place, one at Glenogle Road, one at Leith, and one at Portobello. These depôts have been used as show-rooms and sale-rooms; but their principal and primary object is district offices for the convenience of the public and district stores to facilitate our own operations, as we have from 200 to 300 men continuously engaged in the out-district work, laying mains and service-pipes, fixing meters, fitting up public lamps, attending to gas cooking-stoves, &c.—these men calling at the district depôts for the sundry goods and stores required, instead of returning to the gas-works for them. At the present time, we have no depôts nearer the south side than the New Street Gas-Works, or nearer the west end than Glenogle Road, Canonmills. It was to obviate the inconvenience arising from this, and to avoid the great loss incurred in executing the district work, that the late Mr. David Purves first raised the question some two years ago of opening up five additional depôts, one to be at Newington, one at Morningside, one at Haymarket, one at Gorgie, and one at South Leith; and it was his particular wish that we should prosecute with more vigour and a greater degree of commercial enterprise the policy of selling every device conceivable that the public might require for the domestic utilization of gas. I suggested to him that possibly the "trade" would object to this; and he was most emphatic in his expressions to the effect that, rather than injuring the trade, it would assist it by demonstrating to the public the advantages and the many purposes for which gas could be used, which are new neglected.

The experience of gas administrators throughout the world has been that the trade have never done anything to foster the use of gas. Their interests are too varied, and lie in the direction of selling such appliances as will enable them to retain their customers—for instance, oil lamps and stoves, which require weekly supplies of oil to keep them going, and by which means the trader no doubt obtains other custom for the many and varying classes of goods he may sell; whereas, when they sell a gas appliance their interest ceases on delievery, and it is immaterial whether it is satisfactory to the consumer or whether the Gas Commissioners are compelled, in consequence of a complaint about bad gas, to send their men to adjust the stove for the high-grade gas such as is supplied in Edinburgh, as compared with the English gas for which most of the stoves are made.

The question having now been generally raised, it appears to me that the whole subject should be considered in its broadest aspect. The Commissioners are a Board of Trustees appointed to manage and control the gas undertakings in the interests of the gas consumers, of which there are about 85,000. The ratepayers have no direct liability or responsibility whatever for the gas undertakings. Clause 79 of the Commissioners' Act of 1888 provides that the Commissioners shall fix the price of gas at such a figure as will cover the entire costs and charges in connection with its manufacture, and that any surplus profit or any deficiency arising from the operations of the previous year shall be taken into account when fixing the price for the succeeding year, so as to make the accounts exactly balance. In other words, any profit or loss on the undertaking falls directly upon the gas consumers. Clauses Nos. 80, 81, and 82 provide that, should any unforeseen circumstances arise which would prevent the Commissioners raising sufficient moneys to pay their just debts, then they can request the Corporations of Edinburgh and Leith to levy a rate-in-aid. This clause cannot, however, come into play so long as there are any gas consumers in existence; and its practical effect is merely to guarantee the credit of the Commissioners, and enable them to raise money on the market at moderate rates to carry on the gas undertakings.

Any decrease in the consumption of gas brings about an increase in the cost of production, as a consequence of the on-cost charges remaining the same for the smaller as for the larger amount. It is therefore of supreme importance that the undertaking should be made to continue to expand, and every possible and legitimate means used to encourage the consumption of gas for all domestic purposes. There is a twofold advantage in this. The householders have all the advantages and convenience of carrying on their domestic operations with a minimum of labour, which is an important item in these days of servant troubles; while the population, as a whole, are relieved, and the amenity of the district is enhanced, as a consequence of the absence of smoke from the household chimneys. There is no denying the fact that we are losing ground so far as lighting is concerned. Most of the new houses now being built, even to three and four roomed tenements, are being fitted exclusively for lighting by electricity; and up to a few years ago we had considerable trouble in persuading the builders and the architects to allow us to put in a pipe free of charge, so as to make provision for the fixing of a meter and the supply to cooking-stoves and fires.

Although the traders have had a perfectly free hand for many years to press and foster the utilization of gas for domestic and culinary purposes, the field may be said to be still undeveloped. The reason of this is, in my opinion, partly owing to the want of the conveniences and economy of the apparatus being brought to the notice of the gas-consuming public, and partly to the fact that their cost to the consumer is comparatively high as at present disposed for sale. The trade did nothing to foster the introduction of the gas cooking-stove, which is now admittedly such a boon in every household that has one.

The Commissioners in the year 1890, following the lead of other gas administrators, undertook the hiring-out of gas cooking-stoves at a small rental, amounting to 10 per cent. per annum on their cost. Even this was insufficient to ensure their introduction to the extent that was common in many towns; the drawback being the charges in connection with the fitting up of the stoves in a consumer's house, though this only amounted to from 7s. 6d. to 15s. per stove. The Commissioners, therefore, at a meeting on the 26th of April, 1897, undertook to supply the meters and fix the stoves free of charge in the consumers' houses; the cost of this work being paid for out of the annual rentals. This certainly gave the gas-cooking business an impetus, as will be seen from the following figures relating to the number of stoves hired out year by year:—

Year.	Number.	Total Number on Hire.	Year.	Number.	Total Number on Hire.
1890	8	8	1898	1034	1875
1891	15	23	1899	1344	3219
1892	33	56	1900	943	4162
1893	62	118	1901	1207	5369
1894	144	262	1902	273	5642
1895	127	389	1903	799	6441
1896	184	573	1904	373	6812
1897	268	841			

It is still, however, capable of very considerable development if energetically dealt with. The increase in the price of gas in 1902-3, in consequence of the greatly increased cost of coal, temporarily checked this development. Now that we have re-established our position, and reduced the price of gas to a point lower than it ever was before, it only requires energy to increase this business to a much greater extent.

During the whole period that the Commissioners have been engaged in this business, they have paid £32,616 18s. 11d. for stoves for this purpose. We have received in the form of hires and for sales £9961 2s. 2d. The money received for the hire of stoves and the credits and profits from the sales have been written off the stove capital account. As this account now stands in the Commissioners' books at £15,252 5s. 9d., it will be seen that very liberal depreciation indeed has been allowed on this branch of the Commissioners' business.

With regard to the direct sales of gas appliances, comprising cookers, gas-fires, grillers, burners, hot-plates, copper boilers, kettles, tubing, &c. (all of which, by the way, are especially designed and made for use with gas), the accompanying statement will show the amount of business done in this respect; and as we have hitherto made a practice of never selling below list prices, excepting to the trade, to whom we allow 20 per cent. off list, we may safely say that we have made a profit of 30 per cent. on these transactions—a profit which, in my opinion, would be much better expended in affording our consumers greater facilities in the way of liberal discounts for becoming possessed of domestic gas appliances, such as is done in all other important towns. [The statement referred to consisted of tabulated statistics of the cookers, fires, grillers, bunsen burners, kettles, tubing, and incandescent appliances sold from 1891 to 1904. The total sales are given as follows: Year ending May 15, 1891, £91 6s. 7d.; 1892, £152 8s. 8d.; 1893, £116 4s. 4d.; 1894, £153 13s. 8d.; 1895, £267 8s. 11d.; 1896, £365 2s. 3d.; 1897, £413 2s. 1d.; 1898, £397 8s. 10d. From this year, incandescent appliances come into the statement, and the figures relating thereto are here given in parentheses after the total sales for each year: Year ending May 15, 1899, £843 2s. 10d. (£156 8s. 3d.); 1900, £1313 5s. 5d. (£393 11s. 7d.); 1901, £1051 5s. 1d. (£179 12s. 11d.); 1902, £1044 8s. 1d. (£188 4s. 5d.); 1903, £1178 17s. 10d. (£366 12s. 11d.); and 1904, £1268 3s. 4d. (£386 3s. 4d.). In 1891, there were sold 4 gas-fires, 3 grillers, 1 cooker, and 1 burner; in the year ending May 15 last, 383 gas-fires, 276 grillers, 36 cookers, and 245 burners were sold.]

For the year ending the 15th of May, 1903, we had on our books 84,060 consumers; and the average amount of their accounts, taking large and small together, is £3 0s. 9d. It is, therefore, as well to observe that our business, although a large one on the whole, is made up of a great number of small customers, and that a few shillings are of considerable importance to most of them.

With the present competition of electricity, and the losing of most of our large consumers, the cost of administering the undertaking is increasing as a consequence of our output being now spread over a

large number of smaller consumers, and the disparity between the consumption at mid-winter and the summer season is becoming even more marked than hitherto. During the summer months, 65 to 70 per cent. of the gas-works plant and the distributory system is lying idle, while the capital and interest charges continue.

The gas-works plant must be capable of turning out the maximum quantity of gas required during the mid-winter week. As a matter of fact, the entire output only represents 190 days of full work out of the 365 in the year. In other words, the capital of the undertaking is only fully employed for this period throughout the year, and a large proportion of the plant lies idle during the summer months and the days of longer light. Anything that can be done to bring about a consumption of gas, particularly during this period, enables the whole production to be manufactured at less cost, the increased quantity being produced for the bare works costs—no capital, on-cost charges, or management expenses being involved.

Supposing, the consumption of gas during the summer season could be increased to such an extent as to increase the number of days of full work from 190 by 25 per cent., which is quite feasible, this additional work or output could be produced without adding one penny to the capital charges in connection with the work, nor would it add anything to the general establishment charges, and very little, if any, to the official staff, as it would merely represent a larger consumption for the present consumers, who would be paying for gas instead of for coal to be used in their open fires.

I have prepared a statement on this basis, and I find that there would be an economy of from £27,000 to £30,000 per annum—a sum to be distributed and shared by all the gas consumers proportionately. It therefore becomes a very serious question as to whether the Commissioners should withhold their hands from extending a policy that is calculated to be of such inestimable advantage to their consumers, and at the same time do no harm to the traders, for the simple reason that they are not doing the business now. On the contrary, the business that pays best is in direct competition with gas supply.

So far as I am able to judge from a long experience, and from the full knowledge of what is done in many English towns, I am convinced that the only means of increasing the gas consumption during the summer season and the long days is by putting into the hands of consumers every possible and conceivable device for the use of gas at the lowest cost. The city of Manchester, realizing this principle to the full, now fix and supply, free of all charges or rental, gas cooking-stoves and appliances to their consumers. There are many towns where gas cooking-stoves and appliances are supplied and fixed free of charge in connection with the penny-in-the-slot meters; while all the principal gas undertakings sell their appliances at discounts considerably below list prices. I have been making particular inquiries from some of the most important towns, and I find that Glasgow, London, Sheffield, Nottingham, Bradford, Leicester, Stockport, York, Leeds, Dublin, and Manchester all sell at considerable discounts below list price, ranging to as much 25 per cent. off list; and Liverpool, being a Gas Company, formed a subsidiary Company for the sale and fixing of all gas appliances.

Hitherto I have dealt principally with the use of gas cooking, heating, and domestic appliances. The traders' petition deals exclusively with the question of incandescent lighting appliances; and it is therefore necessary that a few words of explanation with regard to this should be given. The outcry of bad gas which arises every autumn at the commencement of the lighting season in Edinburgh, as in all other towns, is in itself sufficient justification for the Commissioners taking in hand thoroughly and energetically the question of the lighting effect that the consumer obtains from the gas he burns. At present, we lay the gas-mains in the streets, the service-pipes into the houses, supply and fix the meters free, and thereafter take no possible interest or care as to what happens to the gas supply. As a result, I can say without hesitation that the consumer does not get 50 per cent. of the value that can be got from the gas, as a consequence of the defective piping in the houses, choked and defective fittings, and old and corroded and unsuitable gas-burners, speaking particularly at the moment of the ordinary type. I showed, during last winter, burners removed from important houses and public institutions in Edinburgh, yielding only from one-quarter to one-third of the light the gas was capable of giving with a properly constructed or new burner.

The introduction of the incandescent burner, whereby the same gas will yield six times the amount of light in a burner of an altogether different construction to that of the ordinary type, has not made the progress in Edinburgh that it has in many English towns. This burner requires to be particularly made to suit the quality of the gas it is intended to burn; and many years ago, when the Welsbach Company alone were supplying burners in this country, I had some correspondence with them, and we jointly determined the best type of burner for the Edinburgh gas, and came to an understanding that this particular type should be sent to all Edinburgh traders purchasing incandescent burners. At the present time there are a score or more incandescent burners made and supplied by different makers, the origin of which cannot in all cases be traced. The ordinary Welsbach burner now costs 2s. 4d., with mantle, rod, and chimney; whereas I can purchase incandescent burners, looking very similar to the untrained eye, for as low as 8d., with mantle, rod, and chimney. The result of the introduction of such a variety of burners, many of which have not been adjusted, and are altogether unsuited for burning the Edinburgh gas, must inevitably lead to complaining with regard to the incandescent burner in just the same way that the flat-flame burner has been proverbially complained about.

For instance, quite recently I have had several different English makers' burners tested and experimented with most carefully—makers in England who are desirous, and appreciate the necessity, of supplying a special burner for the high-grade gas such as is supplied in Edinburgh. The burner, as it has been imported into Edinburgh, yielded from 19 to 20 candles of illumination per cubic foot of gas consumed; but by adjustment and a proper proportioning of the gas supply to the amount of air mixed with the gas before combustion, we were able to obtain from 28 to 30 candles per foot of gas. While there are five or six makers' burners which have been thus dealt with, there are a score or more of cheap German burners on the market sold through merchants and others who cannot be expected, even if they appreciated the necessity, to adjust a special few for Scottish gas, when they are making burners by the tens of thousands for the world's supply.

There is another very important point to be borne in mind. The construction of the incandescent burner is such that fine dust particles in the room are drawn into the chamber where the air and the gas are mixed before combustion takes place. These dust particles, particularly in workrooms, or arising from the sweeping of carpets, &c., accumulate within the burner stem, and partially choke the gas aperture within, thus giving consequent dissatisfaction. In hundreds of cases last winter, where we received complaints about bad gas, it arose solely from this cause; and our inspectors demonstrated the fact to the parties who had complained—showing them at the same time how to clean them out for themselves. It is in consequence of the delicacy of the incandescent burner, and the necessity of suspending the new mantle over it in such a position that the whole fabric of the mantle will come into direct contact with the flame, that a large number of gas companies have found it necessary to undertake the upkeep and the maintenance of incandescent burners within the consumers' houses, charging a small fee per burner per annum, which also includes the renewal of mantles.

I do not propose to go thus far at present, provided those interested in the sale of burners will look after the consumers' interests. The district depôts are, however, absolutely necessary to enable us to economically carry on our very large business over an area of 52 square miles. They are also of considerable public convenience and importance, and will enable us to demonstrate to the public the efficiency of gas lighting when intelligently applied. To show the most up-to-date appliances in the show-room, and refuse to sell them, out of what, in my opinion, would be a mistaken consideration for the trade, who have never done anything to further the interests of gas consumers, and have simply acted as ordinary traders in their own interests, which is strictly within their rights to do, would be sacrificing the gas-consuming public to the interests of a few individuals—a practice that would be wrong in principle, and one that is not allowed to weigh in the slightest degree with any other public affairs. To characterize this as "municipal trading" appears to me to be merely using a sentimental phrase to blind the public judgment.

When the public convenience demands the introduction of a tramway system, the vested interests of the cab and car proprietors are not for a moment considered. The coal merchants and suppliers of fuel to the public have a greater right to combine and object to the gas consumers substituting gas appliances for coal-ranges than have the traders to object to the Commissioners discharging their trust in the way in which their statutory enactments provide. I have no desire whatever to fall foul of the trading interest. But as my duty is to the Gas Commissioners and the gas-consuming public, unless the trading interest is one with theirs, then I must inevitably be against them; and I fail to see on what ground the 85,000 gas consumers' interests should be allowed to suffer merely because a comparatively few tradesmen are of opinion that they will lose some business which they have hitherto failed to cater for to the extent that is necessary for the well-being of the gas-consuming public.

Judging from the report of the meeting of the traders held on the 15th inst. [June], there appears to be an altogether mistaken impression as to the amount of work performed by the Commissioners' inspectors for which no charge is made. It is only in the exceptional circumstance of our men visiting premises in response to a complaint about bad gas, and discovering that such complaint arises from defective fittings which can be altered on the spot, and the proof of their assertion demonstrated, that anything of this character is performed. Throughout the year, I should think that such work does not represent a ten-pound note. All other work is charged for on the ordinary commercial basis, and a small profit results from the transaction.

ELECTRIC LIGHTING IN THE ISLE OF WIGHT.

The Chairman of the Isle of Wight Electric Light and Power Company, Limited (Mr. F. E. Gripper), was in a very satisfied frame of mind when he moved the adoption of the report and accounts for the year ending Dec. 31 last, at the recent annual general meeting of the shareholders; and in the remarks he made in support of the motion, he endeavoured to show that this happy mood was justified by the contents of these documents. The Directors had ventured to prophesy a profit of £5000, when they appealed to the public to subscribe for the share capital; and, including a small balance brought forward, the amount was £5640, of which £5400 was the result of the year's working. Moreover, the number of lamps had increased from 27,900 to 46,900. This looks very rosy at first glance; but when the accounts are examined critically, a different appearance is presented. In the first place, after payment of the interest on the debentures and preference shares, and writing off £500 for an accumulator, the balance carried forward is £344. This is not very grand for an undertaking on which there has been a capital expenditure of £224,246. The Chairman evidently thought some reference should be made to this large amount—nearly a quarter-of-a-million—which had been laid out to produce by the sale of current £6712, of which £3680 was outstanding at the close of the year; for he explained that the Directors "believed in the policy of supplying current to various parts from which applications had been received, as they invariably found that the number of connections soon increased very satisfactorily." This increase will soon have to show itself, if the concern is to justify the confidence of the Chairman as to the ample security held by the shareholders.

The Company have authority to supply eight towns; but taking only those served from the Newport centre—viz., that town and East and West Cowes—the figures in the last published accounts are instructive. It is impossible to ascertain, from the balance-sheet, the quantity of current consumed; but the net revenue—*i.e.*, the balance applicable for interest and profit—is put down as £11 17s. 11d. for West Cowes

and £78 6s. 5d. for East Cowes. The number of 8-candle lamps, or their equivalent, supplied from Newport, is 16,156. The capital expended in the three towns amounts to £72,880, or about £4 10s. per lamp. As in the case of Canterbury, referred to a few weeks ago, the Company seem to come off very lightly in the matter of rates and taxes; for only £346 10s. 3d. is put down as having been paid on a trading concern employing nearly £250,000 of capital. One cannot refrain from comparing this with the Gas Companies on the island. Those at Newport, Cowes, Ryde, and Sandown have a combined capital of £185,318; yet they pay in rates £1710, or six times as much as the Electric Light Company. It cannot be said that the latter are lavish in their allowance for maintenance, seeing that only £945 (including the £500 written off the accumulator) is charged, which works out at less than 0·5 per cent. on the capital. While speaking of capital, it may be mentioned that the accounts contain an item of £2925 for interest on loans; but there is nothing to show the rate paid. Assuming it is 4 per cent., it represents £73,125 of borrowed money. The balance-sheet shows cash loans of £10,000; but there are sundry creditors to the tune of £78,347. The authorized capital is £100,000, with power to borrow to the extent of half the amount. This has been done on first mortgage debenture stock; so that the expenditure has been £74,246 in excess of the Company's powers. There are £5000 of preference shares on which £658 dividend has been paid; while the holders of £50,000 of ordinary shares receive nothing. The Directors have not hitherto been paid any fees; but they are now to have between them £150 per annum. The total amount paid for wages in 1903 was £882; but the salaries came to £600. Altogether, the Company's last accounts, the striking features of which have been by no means exhausted, are an instructive study.

METROPOLITAN WATER BOARD.

Issue of Water Stock—Transfer of the Undertakings.

A Meeting of the Board was held on Friday, at the offices of the Metropolitan Asylums Board—Mr. R. M. Beachcroft in the chair.

The Finance Committee reported the result of the offer made to the Water Companies to issue 3 per cent. Metropolitan Water "B" stock, at the rate of £109 10s. per each £100 cash awarded. They stated that the West Middlesex Company had, as already reported, agreed to accept stock in discharge of £3,499,850 of the amount payable as compensation. The amount of stock in this case would therefore be £3,832,335 15s.; and it was proposed that the Board should approve of an agreement being entered into with the Company accordingly. When the stock referred to had been issued, there would remain a balance of £24,150 cash due to the Company. The Chelsea Company had in like manner agreed to accept stock in discharge of £3,287,893 of the sum payable as compensation. The amount of stock in this case would therefore be £3,600,242 16s. 8d.; and it was proposed that the Board should approve of an agreement being entered into with the Company accordingly. When the stock referred to had been issued, there would remain a balance of £17,807 cash due to them. The Directors of the other five Companies concerned had either called meetings of their shareholders or submitted the offer made to them, inviting their replies by last Thursday. Part of the arrangement with the Companies was that the stock should be issued and be transferable free of stamp duty. This involved a charge on the Board of 1s. per cent. per annum on the nominal amount of the stock, and was a charge which the Bank of England had throughout recommended should, so far as "B" stock was concerned, be borne by the Board. It was proposed that the dividends on the stock should be payable half yearly at the Bank of England on March 1 and Sept. 1. The Board would issue the stock direct to the Companies, and arrangements had been made with the Bank of England for them at any subsequent date to transfer stock so issued to such persons as the Company might direct, free of charge; or the Board would, if required by the Companies, issue the stock in the first instance in such amounts and to such persons as the Companies might require. By the Metropolis Water Act, 1902, the Companies were entitled to interest on the compensation money awarded equal to the dividends hitherto paid. This interest would cease at the date of the issue of stock to the Companies to the extent of the amount of the stock so issued; and in the agreements to be entered into with the Companies special provision would be made accordingly. The agreements the Committee proposed to be made had to be approved by the Court of Arbitration before the actual issue of the stock took place; and it was hoped that they might be submitted to the Court in time for the Board to pass before the vacation the necessary resolutions creating the stock. The following table shows the replies of the Companies to the Board's offer to issue £109 10s. of water stock for each £100 of cash awarded. The Committee recommended that agreements embodying these figures should be entered into by the Board with the Companies for the discharge of the sums payable as compensation to them for the transfer of their undertakings, as determined by arbitration.

Company.	Award in Cash.	Stock Equivalent accepted in Lieu of Cash.	Water Stock B at 109¾.	Balance.
	£	£ s. d.	£ s. d.	£ s. d.
West Middlesex .	3,524,000	3,499,850 0 0	3,832,335 15 0	24,150 0 0
Chelsea. .	3,305,700	3,287,893 0 0	3,600,242 16 8	17,807 0 0
East London	3,900,000	3,637,626 0 0	3,983,200 9 5	262,374 0 0
Grand Junction . .	3,349,500	2,727,829 0 0	2,986,972 15 1	621,671 0 0
Kent . .	2,712,000	2,697,800 0 0	2,954,091 0 0	14,200 0 0
Lambeth .	4,301,000	4,260,000 0 0	4,664,700 0 0	41,000 0 0
Southwark & Vauxhall.	3,603,000	3,144,806 17 4	3,443,563 10 5	458,193 2 8
	24,695,200	23,255,804 17 4	25,465,106 6 7	1,439,395 2 8

Lord Welby, the Chairman of the Committee, in moving the adoption of the report, referred to the foregoing table, which he said showed the result of the negotiations. The total award in cash to the Companies, as determined by arbitration, was £24,695,200. Stock had been accepted by the Companies equivalent in cash to £23,255,804, which, converted into stock at 109¾, meant an issue of stock amounting to £25,465,106. There was left a balance of £1,439,395, a certain portion of which would be required in cash. It would not be wise, however, to be confident as to the proportion of this sum which they might yet be asked to allow to be given in stock instead of cash. He thought it was probable that a considerable proportion of the amount would be accepted in stock. For instance, they had received notification that morning of £15,000 more being subscribed for stock by the Southwark and £7725 by the East London Company; and no doubt from day to day they would receive further applications of the same nature. The Board would probably desire that, within reasonable limits, such applications should be received and treated with favourable consideration as far as was practicable. It was satisfactory to know that no less than 95 per cent. of the awards to the Companies would be taken in stock, which would leave a balance of something like £2,000,000 to be raised in cash outside. He believed that in the course of the next week the decision of the House of Lords was to be expected; and after that the Court of Arbitration would meet to confirm the agreements which the Board were asked to pass. Nothing then remained to be done except to make arrangements with the Companies for the issue of the stock to them.

The report was adopted, and the recommendations as to the agreements unanimously passed.

The Chairman offered his congratulations to the Board on having surmounted their first obstacle.

The Finance Committee also reported that the sum of £471,467 8s. 6d. was transferred by the Water Companies to the account of the Board on the 24th ult., together with investments to the value of £28,114 16s. 10d.

Mr. E. B. Barnard was appointed a Conservator of the River Thames; and it was decided that, on the rising of the Board on the 22nd inst., there would be an adjournment till the 30th of September.

LAMBETH WATER-WORKS COMPANY.

An Extraordinary General Meeting of this Company was held at the Offices, Brixton Hill, on Thursday last—the Right Hon. Viscount Hampden, G.C.M.G., in the chair.

Mr. H. Wilkins, the Secretary, read the notice convening the meeting, and also two letters from the Metropolitan Water Board with regard to the payment of the compensation to the Company.

The Chairman moved: "That the offer made by the Metropolitan Water Board to discharge the compensation payable to the Company wholly or partly in water stock, in the proportion of £109·10 of 3 per cent. stock for each £100 of cash awarded by the Court of Arbitration, be accepted." He said that several proprietors had asked why the Lambeth Company did not follow the practice of other London Water Companies and ask the assent of the proprietors individually to the proposal, instead of calling that general meeting. The Directors gave very careful consideration to the matter; and they called a general meeting for the following reasons: In the first place, the time at their disposal made it impossible for them to reach those proprietors who, in all probability, would have been most anxious to take stock—such, for instance, as trustees travelling, and proprietors resident in Canada, New Zealand, China, and India. By the effusion of time, these would have been compelled, probably against their will, to accept cash and be put to the trouble and expense of finding other investments. These, and proprietors under legal disability (the water stock being a Trustee security), were protected by the course the Directors had adopted, because the decision of the general meeting would bind absent proprietors—assuming that the offer of the Water Board was accepted by the general meeting. The Board were emphatically of the opinion that the proprietors represented at the general meeting should accept the terms offered by the Water Board. If the London Water Companies had acted in unison, better terms might possibly have been obtained; but the terms offered having been accepted independently by some of the Companies, the others could hardly fail to follow suit, because any agreement made was subject to confirmation by the Court of Arbitration, who would not be likely to assent to differential rates even in the improbable event of the Water Board doing so. The effect of the offer was clearly described in the circular of June 22. The Company got a stock which now stood at a premium, yielding £3 5s. 8d. per annum. Taking recent dividends as a standard of comparison, they obtained the equivalent of their maximum dividend in perpetuity and a permanent annuity of £4922 15s., instead of a terminable one of £14,500. And it was to be borne in mind that the terminable annuity of £14,500 would have been subject to fluctuations and possible diminution by frosts, the continued increase of local rates, and, more than all, by the operation of the Chamberlain's sinking fund. As the circular of June 22 informed the proprietors, no scheme for the distribution of compensation could be proposed until they knew the decision of the House of Lords on the question whether the undertaking was to be valued as subject to, or free from, the obligation to contribute to the Chamberlain's sinking fund. In the meantime, and until a scheme was prepared, the proprietors would receive interest in proportion to their holdings. He had every reason to believe that the interest would be equal to the dividend they had been receiving. The date had not been decided at present; but the water stock they would receive in exchange for their holdings would bear interest at a certain date to be decided hereafter—probably April and October, for convenience in the income-tax arrangements. On the whole, the Directors recommended the proprietors to accept the offer—taking the compensation stock at the prices quoted. If any proprietors preferred to take cash, they could realize their holdings at the market price of the day—probably to as great advantage as if they accepted cash when the

time arrived for the distribution of the compensation three or four months hence. If any proprietors present would prefer to take cash, and would express a desire to this effect, the Directors would ask the Water Board to pay them sufficient cash to enable them to satisfy such claim. There was no doubt in the minds of the Board that the proper thing would be for the proprietors, having regard to their best interests, to accept the offer. If they accepted it, he did not think they would have done very badly.

Mr. W. J. FRASER seconded the motion, and said that, in taking the course the Directors now recommended the shareholders to adopt, they had been animated by that magnanimous and lofty spirit which had ever characterized the proceedings of the various Metropolitan Water Companies. It was only fair to say that all the negotiations in which they had been engaged for some time past—ever since notice of the Bill, now an Act of Parliament, was given in the House of Commons—the Chairman especially, the Directors, and the Secretary of the Company had had a very arduous and anxious time, working to secure that the proprietors should receive that fair and just treatment to which they were entitled.

A SHAREHOLDER asked when they were likely to have the decision of the House of Lords.

The CHAIRMAN said the case was practically concluded, and the House of Lords had reserved judgment.

The SHAREHOLDER asked who was to settle the division between the 10 per cent. and the 7½ per cent. stocks.

The CHAIRMAN replied that the Directors had to prepare a scheme, which they could not do until the decision of the House of Lords had been arrived at; and they would then take into consideration the views expressed by various proprietors. They would prepare a scheme at once; and it would be sent round to each proprietor.

Mr. ROBINSON, of Birkenhead, said what the Chairman had stated in his speech appeared to him to be very much clearer than the printed circulars which were sent to the proprietors. He took it that their 7½ per cent. and 10 per cent. stocks would not only benefit by the money awarded in the exact proportion of 10 to 7½, but, as the Chairman had pointed out, he understood it to be that the terminable annuity of much greater length of years for the 10 per cent. would naturally make that a better cash result than the 7½ per cent., even in proportion. This was the way he understood it; and if that was so, he was quite sure, for his own part and the majority of the shareholders, that they would be quite content to accept the decision of the Board as to details of figures. He had to express, as a trustee, his satisfaction at the course adopted by the Board in taking upon themselves, as they had done, not to require the signature of each individual trustee. With regard to the Chairman's reply as to the decision of the House of Lords about the Chamberlain's fund, of course they could not expect any official announcement yet.

The CHAIRMAN said that probably the decision would be given in a few days.

The resolution was adopted.

The CHAIRMAN moved: "That the Directors be empowered to enter into an agreement on behalf of the Company with the Metropolitan Water Board for the discharge, in the manner aforesaid, of such compensation, and that such agreement shall contain all such stipulations, provisions, and conditions with regard to the matter as the Directors may deem necessary or expedient."

Mr. G. E. N. RYAN seconded the motion; and it was adopted.

Mr. ROBINSON asked the shareholders to remain for a moment to support a cordial vote of thanks to the Chairman for his conduct in the chair. If this was to be the last regular meeting, he should like to add a few words expressive of his very high appreciation of all that the Board had done for the proprietors in the matter from first to last. He happened, fortunately, to represent an interest in this and other Water Companies; and the interest in this Company had existed for fifty years. The result consequently had been extremely satisfactory to the beneficiaries. He was sure that the resolution would be seconded and carried unanimously; and so he moved a vote of thanks to the Chairman, the Board, and the officials of the Company for the excellent work they had done for the proprietors.

Rev. H. GARDNER had great pleasure in seconding the motion.

The resolution was cordially adopted.

The CHAIRMAN, on behalf of his colleagues on the Board and the staff of the Company generally, thanked Mr. Robinson for the very handsome terms in which he had moved the vote. They had all done their best; and it was a great gratification to them to receive such a high compliment from the shareholders then present. It would always remain a pleasant memory to them.

The proceedings then concluded.

TEIGNMOUTH WATER SUPPLY.

Satisfactory Agreement with Paignton.

At a Meeting of the Teignmouth District Council last Tuesday, it was decided to conclude the agreement with the Paignton District Council for a supply of water from the new works which Paignton is constructing on Dartmoor. The Chairman (Mr. W. M. Bird) accordingly signed the agreement. This practically ends a controversy which has gone on for years at Teignmouth, where the water supply has been, and continues to be, a source of anxiety in dry seasons. Under the agreement, the terms of which were summarized in the "JOURNAL" on the 10th of May last (p. 403), Teignmouth will obtain an abundant supply of water, practically in perpetuity, on very advantageous terms, and without any further capital outlay than that of the cost of the main. By the final decision of the Councils as to the route, this cost will be somewhat increased. It was originally proposed to carry the pipe by the most direct route to the point at which the Paignton main approaches nearest to Teignmouth. The distance

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

The Economical Gas Apparatus Construction Co., Ld.

W. H. PEARSON, Chairman.
W. H. PEARSON, Junr., Deputy-Chairman.
J. T. WESTCOTT, Manager.
L. L. MERRIFIELD, M.Inst.M.E., Engineer.

London Offices: 19, ABINGDON STREET, WESTMINSTER, S.W.
American Offices: TORONTO. TELEGRAPHIC ADDRESS: "CARBURETED, LONDON."

CARBURETTED WATER-GAS ENGINEERS.

The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cub. Ft. Daily.		Cub. Ft. Daily.		Cub. Ft. Daily.
BLACKBURN.	1,250,000	ST. CATHERINES (Remodelled)	250,000	TONBRIDGE	300,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	KINGSTON, PA.	125,000	STRETFORD	500,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT.	250,000	OLDBURY	300,000
COLCHESTER	300,000	WILKESBARRE, PA.	750,000	TODMORDEN	500,000
BIRKENHEAD	2,250,000	ST. CATHERINES (2nd Cont.)	250,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000	YORK (Second Contract)	750,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000	ROCHESTER (Second Contract)	500,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	COLCHESTER (Second Contract)	300,000	NEWPORT (MON.)	250,000
HALIFAX	1,000,000	YORK	750,000	TOKIO, JAPAN	1,000,000
TORONTO	250,000	ROCHESTER	500,000	PERNAMBUCO (Brazil)	125,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	MALTON	150,000
LINDSAY (Remodelled)	125,000	CRYSTAL PALACE DISTRICT	2,000,000	DULUTH, MINN. (2nd Cont.)	300,000
MONTREAL	500,000	DULUTH, MINN.	300,000	BROCKVILLE (ONT.)	250,000
TORONTO (Second Contract Remodelled)	2,000,000	CATERHAM	150,000	SMETHWICK	500,000
BELLEVILLE	250,000	LEICESTER	2,000,000	GRAVESEND	300,000
OTTAWA (Second Contract)	250,000	ENSCHEDE (HOLLAND)	150,000	NEWPORT MON. (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	TORONTO (Third Contract)	750,000
		BURNLEY	1,500,000	TORONTO (Fourth Contract)	1,000,000
		KINGSTON-ON-THAMES	1,750,000	MONTREAL, ONT. (2nd Cont.)	1,800,000
		ACCRINGTON.	500,000	HAMILTON, ONT.	400,000

LEEDS, 1,800,000 C. Ft. LEICESTER (2nd Cont.), 1,000,000 C. Ft. NEWCASTLE-ON-TYNE, 1,800,000 C. Ft.

AND, IN ADDITION, 3,000,000 CUBIC FEET DAILY; also Coal-Gas Plants at NELSON, B.C., CHATHAM, BERLIN, NAPANEE, OWEN SOUND, CALGARY, and WINNIPEG.

in that case would have been 9½ miles. It, however, meant going through the chief street of Newton Abbot, and as the Newton Abbot District Council objected to this, and allowed it to be known that the scheme would be opposed, it was decided to take another course 1900 yards longer. The Chairman expressed the opinion that the cost of the additional length of pipe would be little in comparison with that of fighting Newton Abbot, and the change would remove a great blot on the original scheme. Under the agreement, Teignmouth is conceded the right of supplying water to any of the villages on the line of its main, and by the course now to be followed it may have five of such possible customers. Great satisfaction was expressed by the Teignmouth Council, and was felt in the town, at the conclusion of the negotiations; and the Chairman acknowledged the courtesy with which the Paignton Council had met them on all points. The agreement was signed by the Paignton District Council on Thursday; and satisfaction was expressed at its conclusion as a matter which would be advantageous to both towns.

PLYMOUTH CORPORATION WATER SUPPLY.

Visit to the Works.

The members of the Plymouth Corporation paid their annual visit to the water-works on Wednesday last, on the occasion of what is known as the "Fishing Feast." As usual, they assembled at the intake of the reservoir, and drank in water to "The Pious Memory of Sir Francis Drake," the constructor of the original works for the supply of Plymouth, and also, in wine, the toast "May the descendants of him who brought us water never want wine." At the dinner afterwards, Mr. A. R. Debnam, the Chairman of the Water Committee, made a statement as to the progress of the undertaking. He said the mains had been extended by 2¼ miles, compared with 3¾ miles in the previous year; and the total length was now 124 miles. The new domestic supplies last year were 499, against 514 before, and the new meter supplies 63, against 100. The income for 1903-4 was £29,942; while in the previous year it was £28,262. Ten years ago the income was only £16,015. If the charges for water for domestic and trade purposes were the same in Plymouth as at Birmingham, their income would be £83,721; while if they were at the same rate as at Leicester, it would be £84,288; if the same as at Newport, £87,120; and if the same as at Hastings, £169,886. These figures referred to the water undertakings of Corporations. With regard to the comparison with Companies, if Plymouth water was sold at the same rate as the Devonport Company charged, the annual income would be £46,441, against £29,942; if the same as the West Middlesex Company, £76,007; as the Grand Junction Company, £78,188; as the Chester Company, £86,550; and the New River Company, £89,248. If the Plymouth Corporation charged in a somewhat reasonable way, the same as some other corporations and companies, they could increase their rates immensely. It would, however, be only taking the money out of one pocket and putting it into another; so they continued to have a cheap water supply. At Birmingham, the price per 1000 gallons was 9¼d.; at Leicester, 9½d.; at Newport, 9¾d.; at Hastings, 1s. 7d.; at Devonport, 5¼d.; in West Middlesex, 8½d.; in the district of the Grand Junction Company, 8¾d.; at Chester, 9¾d.; and in the district of the New River Company, 10d. At Plymouth it was about 3d. He hoped this year the Water Committee would be able to increase their income from some small source by about £1000. It was also his hope that the charges, whether for domestic or trade purposes, would not be increased. The Town Clerk (Mr. J. H. Ellis) also referred to the low charges for water and gas as a set-off to the high rates, and contended that in regard to the prices of these commodities Plymouth compared very favourably with most towns. Mr. F. Howard, the Water Engineer, stated that during the past year a great deal had been done in the direction of checking waste of water. There had been a saving of about 3½ gallons per head per day, or 450,000 gallons per 24 hours.

STANDARDIZATION OF WATER-FITTINGS.

We learn that the Joint Committee on Water Regulations, the formation of which has already been recorded in the "JOURNAL," have appointed three Sub-Committees, whose functions are—

Sub-Committee "A" (Bye-Laws and Regulations).

1.—To consider and report upon the codification of those bye-laws and regulations relating rather to administration than to technical details concerning workmanship or materials and fittings, as, for example, those relating to (*a*) agreements with consumers, (*b*) penalties for infraction of bye-laws, (*c*) misuse of water, &c.

2.—To receive the reports of Sub-Committees "B" and "C," and to prepare a model code of bye-laws and regulations affecting the prevention of waste, misuse, and contamination of water, covering their recommendations as far as possible in a form suitable for general use in connection with water undertakings, and for submission to the Local Government Board for its approval.

3.—To consider and report upon the desirability of promoting legislation either (*a*) to render the adoption of this code compulsory, or (*b*) to promote and facilitate its general adoption by all water authorities.

Sub-Committee "B" (Fittings and Materials).

To consider the various service-pipes and fittings required in connection with domestic, trade, and municipal water supply, with special reference to (*a*) preparing a list of the principal fittings in common use, or otherwise suitable for standardization; (*b*) framing a uniform nomen-

Why do **MOST**
Gas Consumers
insist on having

Richmond's Cookers

Works—
ACADEMY STREET, WARRINGTON.
CARPENTER'S ROAD, STRATFORD.

Not from sentiment, but simply because they are value for money.

clature; (*e*) preparing standard specifications for the quality and nature of the materials used in the manufacture of the same, with special reference to different classes of water; (*d*) preparing a table of standard weights for service-pipes and fittings, classified into three or more divisions for varying pressures; (*e*) preparing standards for tests and examination of service-pipes and fittings, and advising upon the best method of stamping approved fittings of all classes; (*f*) reporting upon the best system for facilitating the testing and stamping of service-pipes and fittings throughout the country; (*g*) reporting upon the best system of securing the general adoption of all standards recommended.

Sub-Committee "C" (Workmanship).

1.—To consider and report on the general question of plumbers' work in connection with water-fittings, with particular reference to marking plumbers' work.

2.—To consider and report upon the Plumbers' Registration Bill, with particular reference to a possible extension of its scope in accordance with the findings of the Committee.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

On Tuesday, the Town Council of Perth held a special meeting to consider the gas and electricity accounts for the past year, along with the report by the Auditor, Mr. R. F. Cameron. Mr. Cuthbert, the Convener of the Gas Committee, moved the adoption of the gas accounts. He said that last year the gas department had been booming; they had done better than they ever had done before, though tar, for one thing, had fallen in value during the year by as much as 30 per cent. In 1898, the gas used was 136 million cubic feet. It had increased year by year, and last year amounted to 179 million cubic feet—an increase of 14 million cubic feet upon the previous twelve months. Last year they made a new departure in charging a preferential rate for gas used in trade purposes. They estimated that 9½ million cubic feet would be sold for these purposes; but they had actually sold 13 million cubic feet. This showed that the reduction in price had met with the appreciation of the consumers. The expenditure, of course, had risen slightly, owing to the increased consumption of coal; but they were, nevertheless, able to put aside from revenue two sums for gas-stoves and maintenance. The Auditor, they would observe, made some remarks in regard to gas-stoves. He objected to repairs upon these being paid out of revenue; but there was a minute of the Council, adopted in October last, which brought out that at that time a sum of £2500 had been paid out of capital for gas-stoves, and it was recommended by a Committee that this should be paid out of revenue, and spread over a series of years. The Council did not adopt this recommendation, but delayed the matter. The Auditor thought that the depreciation of gas-stoves should be spread over a period of ten years; but he considered that twenty years was a fair time to take, as the stoves were practically indestructible. Last year about £400 was applied to depreciation; and this year they had set apart a sum of £500 for the purpose. As years went on, this would be continued. Last year they reduced the gas annuities by £5742. All through the year, both in the working and in the finances, they had had a progressive period. The thanks of the Town Council were due to Mr. M'Lusky (the Engineer), to the Gas Treasurer (Mr. Lindsay), and to all the other officials, down to the humblest labourer, for the energy and industry they had displayed. He moved the adoption of the accounts and the Auditor's report. A discussion arose, in which Treasurer Lawrie moved that the accounts be adopted on the distinct understanding that the suggestions of the Auditor be carried out. These, it appeared, would involve the setting aside of £750 instead of £500 for depreciation of gas-stoves; and that the contingency fund, amounting to £914, should be invested in other securities than their own. The amendment was carried by eight votes to seven. The adoption of the estimates for the current year then presented a difficulty. Mr. Cuthbert said the proposal was to reduce the price of gas from 3s. 2d. to 3s. per 1000 cubic feet, and the collectors were already out on the 3s. basis. He was induced to proceed, and moved the adoption of the estimates, remarking that the price for trade purposes was to be kept at 2s. 8d. per 1000 feet. It was reduced by 6d. last year; and it was thought that small consumers should get the advantage now. By twelve votes to three, the Council adopted the estimates, and reduced the price of gas as recommended.

The recommendation of the Gas and Electricity Committee of the Aberdeen Town Council, that Mr. Charles E. Smith should be appointed Assistant Gas Engineer, and that his salary be increased from £120 to £150, came before the Town Council on Monday. Mr. Kemp, the Convener, in moving it, said that Mr. Smith was a son of their late Engineer, who was in their service for so many years, and he was proving himself quite a worthy son of a worthy sire. The appointment was objected to, on the familiar ground that increases of wages to workmen were not so readily recommended by the Committee; but the Council, by 22 votes to 6, adopted the recommendation.

It is intimated that the Dunfermline Corporation Gas Committee have had before them the financial results of the working of the gas undertaking for the past year. There is a credit balance of £369. The estimated surplus was £1261, and the reduced amount is explained by the circumstance that during the year the Committee decided to use a better quality of coal in order to improve the illuminating power of the gas. The sum estimated for coal and labour was £4413; but it had amounted to £5459. The maintenance of works and plant was estimated at £1150, and it had cost £1428. The estimate for carbonizing was £750, and the actual outlay had been £1107. On the other side of the account, the revenue was estimated at £12,203, and it had been £12,586. It is calculated that, with a continuance of present

WALKER'S PATENT

SULPHATE OF AMMONIA PLANT

Recovers the WHOLE of the Ammonia.

SULPHUR RECOVERY PLANT

For Recovering the Sulphur from Waste Gases of Saturator.

FOR FULL PARTICULARS AND MODELS OF PLANT, WRITE

C. & W. WALKER, Ltd.,

Midland Iron Works: DONNINGTON, NEWPORT, SALOP.

London Office: 110, CANNON STREET, E.C.

prices, there will be a small surplus at the close of the present year. The price of gas is 2s. 9d. per 1000 cubic feet for ordinary consumers, 2s. 6d. for gas-engines, and 3s. 4d. for prepayment meters.

In the Inverness Town Council on Monday, Treasurer Birnie said they had not yet got a completed balance of the gas accounts for the past year, but they were in a position to say that on the year's working the profits would exceed £1000. This was extremely satisfactory, considering the reduction made in the price of gas last year—from 3s. 9d. to 3s. 4d. per 1000 cubic feet to ordinary consumers, and from 3s. 9d. to 2s. 10d. for public lighting. It was indicated last year that the reduction should have been made earlier, and that it would be no spasmodic reduction, but would remain for years, so long as materials did not rise in price. He was not only confirmed in this opinion, but he thought they could now make another reduction of 5d. per 1000 cubic feet. They had a balance at the credit of profit and loss account of no less a sum than £12,000. He thought they would agree with him that their interests in the Gas Department were being ably looked after by Mr. A. Thomson and his assistants, and that they deserved all the praise they could give them. The suggestions of the Treasurer are to be considered by the Council when the completed gas accounts are laid before them.

The Cupar Gas Company last year earned a profit of £940, which, with a balance of £191 from the previous year, makes a sum of £1131 available for distribution. It is proposed to pay dividends of 5 per cent. on the preference, and of 35s. per share on the ordinary stock, to place £250 to capital for depreciation, and carry forward £188.

The Stevenston Gas Company held their annual meeting on the 14th ult. The report of the Directors stated that the profit on the year's operations amounted to £507, and that the balance at the credit of profit and loss account was £546. A dividend at the rate of 8½ per cent. was paid, £50 was applied in the reduction of the meter account, £50 in the reduction of the book value of a bond, and £140 was carried forward.

The annual meeting of the Brechin Gaslight Company was held on Monday last—Mr. James Guthrie, J.P., in the chair. The Manager —Mr. Allan Reid—submitted the annual balance sheet, which showed a net profit of £1544. After setting aside £500 for depreciation, and carrying forward £67 to next year's account, a dividend at the rate of 25s. per share, the same as last year, was declared. Notwithstanding their having had three years' competition with electricity, the quantity of gas sold exceeded that of any previous year in the Company's existence. He paid a high tribute to Mr. Reid for his work, and proposed an increase of £35 to his salary, stating that by this step they had been able to keep Mr. Reid in Brechin, as he was on the short leet for the Montrose vacancy. This was agreed to by the shareholders unanimously. The price of gas was reduced from 4s. 6d. to 4s. 4d. per 1000 cubic feet for illuminating purposes, and from 4s. to 3s. 9d. for cooking, heating, and power purposes.

At the meeting of the Newport (Fife) Town Council on Monday, Mr. Thom, in submitting the Corporation accounts for the year, said it was pleasing to report steady progress in the Gas Department. It was creditable to the management of that department that the gas accounted for showed an increase of fully 15 per cent. The increase in the gas carbonized per ton of coal showed the benefit of new and up-to-date works, supervised by a Manager whose zeal was only excelled by his efficiency, seconded by an enthusiastic Convener. As proving the increased popularity of their gas, there had been an addition to meters and stoves during the year of £225.

The dispute between the Carnoustie Gaslight Company and the Town Council with reference to the charge for gas for public lighting, which it was thought was settled some time ago, has again cropped up. The charge by the Company was £212. When the account was presented, the Town Council took exception to it; and on inquiry being made, it was found that in a number of the lamps burners consuming 5 cubic feet of gas per hour had been substituted for those consuming 3 cubic feet. This had been done on account of complaints as to want of light. It was done with the knowledge and consent of the Corporation Lighting Inspector. This was believed by the Company to bind the Corporation, when taken in conjunction with an order by the Corporation Lighting Committee to have the lighting improved. The Corporation, however, upon the ground that they had not sanctioned the increased consumption of gas, refused to pay the account; and at their meeting on Monday they agreed to offer £135 15s. in full of the Company's claim. The Directors of the Company met on Wednesday to consider the offer. In a spirit of conciliation, they agreed that, while they should not accept the offer, they will settle the difference by accepting £160. They had previously offered to take £170. It is expected that the Company's terms will be accepted by the Corporation.

I mentioned the accounts of the Galashiels Gaslight Company last week. The annual meeting of the shareholders was held on Tuesday. The Chairman—Mr. J. Sanderson—said it was gratifying to see that there had been an increase in profits and also in the consumption of gas. Referring to the reduction in the candle power, he said that hitherto their standard had been 28 candles, but a new element had arisen, in the shape of incandescent lighting, which did not require so high an illuminating power. The Directors had carefully considered the subject, and they had decided to keep up the high standard of gas, although reducing the candle power from 28 to 25 candles; and the price was to be lowered from 3s. 4d. to 2s. 11d. per 1000 cubic feet.

The Alyth Gaslight Company earned a profit last year of £340. A dividend at the rate of 5 per cent. has been declared; and the Manager —Mr. A. Robertson—has been granted an honorarium of five guineas. The Lochgelly Gas Company, Limited, have resolved to reduce the price of gas from 4s. 3d. to 3s. 9d. per 1000 cubic feet for lighting, and to 3s. 4d. for cooking, heating, and motive power. They have paid a dividend at the rate of 7½ per cent. There was a large increase in the consumption of gas during the year. The Dalkeith Gaslight Company have resolved to reduce the price of gas from 3s. 9d. to 3s. 6d. per 1000 cubic feet. The Bonnyrigg and Lasswade Gas Company have

COKE BREEZE

Can be satisfactorily removed by Screens; but by using Little's Conveyors for carrying away the Coke from Retorts, the only Breeze to be handled is that which is inseparable from all systems of carbonizing. This can usually be burned under the Boiler, so very little need be put into the

INCLINED RETORTS.

Breeze is the bugbear of all Gas Engineers, as every cwt. handled is not only a loss in value, but represents wear on the plant.

OUR SPECIALITIES:	OUR AIM:
COKE CONVEYORS.	NO SUPERFLUOUS BREEZE.
COAL CONVEYORS.	LONG LIFE.
INCLINED RETORTS.	RESULTS BETTER THAN HORIZONTALS.
SHALLOW INCLINES.	LOW COST—WITH EFFICIENCY.

NEW CONVEYOR Co., LTD., SMETHWICK.

reduced the price of gas from 4s. 4½d. to 4s. 2d. per 1000 cubic feet. The Largs Gas Company have paid a dividend for the past year at the rate of 7 per cent., and have reduced the price of gas from 4s. 7d. to 4s. 2d. per 1000 cubic feet. The Anstruther Gas Company closed their year with a profit of £562, and they had a sum carried forward from the previous year of £127. A dividend at the rate of 5 per cent. has been paid, £100 has been placed to capital account, £230 has been allowed for depreciation, and £108 has been carried forward. The annual balance-sheet of the Coupar Angus Gaslight Company shows a free balance of £570, as compared with £235 a year ago. A dividend at the rate of 6 per cent. has been paid. It was agreed to increase the salary of the Manager—Mr. W. F. Vernon—by £15. The Leslie Gaslight Company have paid a dividend at the rate of 7½ per cent. The Markinch Gaslight Company have paid a dividend at the rate of 5 per cent., and have granted the Manager—Mr. A. Scott—a bonus for his good services during the year. There was an increase in the consumption of gas in the twelve months.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *July* 9.

Sulphate of Ammonia.

There has been no special feature in the market upon which to comment. Makers having cleared out their stocks as far as possible for the end of the half year, available supplies have been in limited compass. On the other hand, there has been no great demand; so that values have only been about maintained. The closing quotations are £11 17s. 6d. per ton f.o.b. Hull, £12 per ton f.o.b. Liverpool, and £12 2s. 6d. per ton f.o b. Leith. In the forward position the situation is unchanged, buyers being unwilling to pay the prices demanded by makers. Speculators continue to offer near months at the level of the spot market, but without much success. Buyers seem to be looking for some decline in values, and without much reason, in view of the comparatively heavy shipments made in June—about 2000 tons increase upon those for the same month last year.

Nitrate of Soda.

This article is quiet but firm at 9s. 9d. to 10s. per cwt., according to quality, on spot.

LONDON, *July* 8.

Tar Products.

Business is very dull all round; and there is an absence of demand. Pitch continues quiet, although there is really no alteration as regards values. There are several inquiries for January-June, 1905; country distillers as a rule do not care to sell so far forward—being uncertain as regards tar. London makers still ask 32s. to 32s. 6d. in any position; but neither dealers nor consumers are prepared to pay this price. The demand in South Wales appears to have ceased for the time being. Probably consumers are now well supplied for the next two or three months, and prefer waiting before contracting over next winter. As to anthracene, there is a report that a large quantity of 45 per cent. has been sold at a fairly good price to German consumers for early delivery; but over next year makers as a rule decline to sell. There is really no actual business to report in benzol. There are still sellers of 90 per cent. at 9d. f.o.b. London; while in the North 50-90 per cent. is reported to have been placed at 7d. per gallon, for delivery over the next three or four months. The demand for solvent naphtha continues to improve, especially as regards home consumption; but there does not seem to be any actual improvement as regards prices. There is certainly, however, more inquiry, especially for delivery over the last three or four months of the year; and it seems probable that a slight improvement may take place in the article. In carbolic acid, the demand is scarcely so good, and makers seem to be more desirous of selling for forward delivery. Consumers, however, appear to have ceased buying for the time being; and evidently it is dangerous to try to force the price over 2s. per gallon, as whenever this has been done recently it has had the effect of stopping the actual demand by the consumers, who do not appear to be at all willing to pay over this price for either prompt or forward delivery. It is very difficult indeed to fix the value of crystals, as second-hand parcels are being offered by dealers at prices considerably under those which makers are willing to accept. The position of creosote remains unchanged. There is still a fairly good inquiry in the North. Consumers, however, do not seem willing to pay more than 1¼d. at makers' works; while as a rule distillers ask from 1⅜d. to 1½d., according to quality and situation. In London, small sales are reported at 1 7/16d. to 1⅝d.; but there is not much trade doing, as it is impossible to arrange business for export owing to the difficulty in obtaining barrels.

The average values during the week were: Tar, 17s. to 22s. Pitch, London, 31s. to 31s. 6d.; east coast, 31s.; west coast, 29s. to 29s. 6d. Benzol, 90 per cent., 9d.; 50-90 per cent., 7d. Toluol, 6½d. to 6¾d. Crude naphtha, 3d.; solvent naphtha, 7d. to 8⅛d.; heavy naphtha, 9½d. to 10d. Creosote, London, 1¼d.; North, 1⅛d. to 1⅜d. Heavy oils, 2⅛d. Carbolic acid, 60 per cent., 2s. Refined naphthalene, £5 to £8; salts, 22s. to 24s. Anthracene, "A" quality, 1¾d. to 2d.; "B" quality, 1d., nominal.

Sulphate of Ammonia.

The market is decidedly quiet; and there is very little business doing for either prompt or forward delivery. Beckton still quote £12 2s. 6d., but would accept £12, could they find anyone willing to pay this price. The South Metropolitan Company maintain their price at £12 5s.; but this is purely nominal, and there is no business doing at this figure. In Hull, there are sellers at £11 17s. 6d.; but buyers appear indifferent to this market just at present. Makers in Leith as a rule ask £12; but buyers will not pay more than £11 18s. 9d., at which price it is reported that a small business has been done. In Liverpool, there is an absence of business. There are sellers at £11 18s. 9d.; whereas buyers will not pay more than £11 17s. 6d.

THE
MAXIM PATENT CARBURETTOR
FOR ENRICHING GAS IN BULK.
PREVENTS NAPHTHALENE DEPOSITS.
OVER 120 MAXIM PATENT CARBURETTORS HAVE NOW BEEN FIXED.
Among the Companies and Towns supplied are The Gaslight and Coke Company, The South Metropolitan Gas Company, Birmingham, Leeds, Rochdale, Bristol, Sheffield, Oldham, Dundee, Perth, Dunfermline, and many other Works, both large and small, where they have been working in some instances for the past Ten Years.
MORE GAS & SALEABLE COKE PER TON of COAL CARBONIZED is PRODUCED; SAVING CAPITAL, LABOUR, FUEL, WEAR & TEAR, &c.
THE ENRICHMENT IS INSTANTANEOUS AND PERMANENT.
The Carburettor is inexpensive, easily fixed, and entirely supersedes the use of Cannel.
Dealers in Benzol, Carburine, and all other Naphthas and Oils suitable for the Enrichment or Production of Gas.
For Prices and full Particulars, apply to
THE GAS LIGHTING IMPROVEMENT COMPANY, LIMITED,
18, DEVONSHIRE STREET, BISHOPSGATE, LONDON, E.C.

COAL TRADE REPORTS.

Lancashire Coal Trade.

The Gas Department of the Manchester Corporation have just fixed contracts for a supply of 270,000 tons of coal and cannel during the next twelve months at prices so much under those which they had to pay a year ago that the saving represents a sum of no less than £9000. The coal market generally has been dull this week. House-fire descriptions have been in very meagre request; and the price continues at so low a figure that colliery proprietors do not feel themselves called upon to make any further reduction. The prices for slack are well maintained, with a hardening tendency. Best house-fire coals are 13s. to 14s. per ton, seconds 11s. to 12s., and common sorts 8s. 6d. to 9s. 6d. and 10s. Steam and forge coals are 8s. 6d. to 8s. 9d. for ordinary qualities, and 8s. to 8s. 3d. for common. Best slack is quoted at 6s. to 6s. 6d. per ton at the pit, medium 5s. to 5s. 6d., and common 4s. to 4s. 6d.

Northern Coal Trade.

There is a slightly better tone in the coal trade of the north-east; but it is one that shows itself more in the quantity than in the price. In steam coals, best Northumbrians are quiet. The production is fairly taken up; and the price is from 10s. to 10s. 4d. per ton f.o.b., with second-class steams from 8s. 9d. to 9s., and steam smalls from 4s. to 4s. 6d. In the gas coal trade, the demand is fair, and the price steady for this season, more especially for the best qualities. Good Durham gas coals vary from 8s. 3d. to 8s. 9d. per ton f.o.b., and second qualities are 3d. to 4½d. per ton lower. One contract for shipment has been allotted in the last few days—at about 8s. 1½d. per ton, with the usual freight allowance. Gas coke is rather scarce; the great bulk of the early output being contracted for in some cases. Good gas coke, on Tyneside, is from 13s. 3d. per ton f.o.b.

Scotch Coal Trade.

Trade continues in a depressed condition. There are large stocks on hand at the collieries; and in many of them full time is not being worked—in some instances not much more than half. The better qualities are the greatest drug. The prices quoted are: Main 7s. to 7s. 3d. per ton f.o.b. Glasgow, ell 7s. 9d. to 9s., and splint 8s. 3d. to 8s. 6d. The shipments for the week amounted to 235,511 tons—a decrease of 32,802 upon the preceding week, but an increase of 10,295 tons upon the corresponding week of last year. For the year to date, the total shipments have been 5,525,146 tons—an increase of 165,197 tons upon the same period of 1903.

Sale of Shares.—At the Mart, Tokenhouse Yard, last Tuesday, Mr. Alfred Richards sold, by order of the Directors, a new issue of £3000 of 4 per cent. perpetual debenture stock at from £100 to £100 10s. per £100 of stock. On the same occasion, he placed some "A" and "C" stock of the Barnet District Gas and Water Company (last dividend at the rate of 7½ per cent. per annum) at from £160 to £162 per £100 of stock, and some "D" gas stock (last dividend £5 5s. per cent. per annum) at £111 per £100.

Maintenance of Incandescent Burners at Kilkenny.—The Kilkenny Gas Company have given notice to the consumers that they are prepared to maintain and clean incandescent burners, renewing the chimneys and mantles, at a monthly charge of 3d. per burner up to three, 11d. for four, 1s. 1d. for five, 1s. 3d. for six, and 2d. for each additional burner. The Directors hope, by relieving the consumers of the trouble of attending to incandescent burners for an inclusive charge, this system of lighting may be more generally adopted.

Introduction of Slot Cookers at Southport.—On the recommendation of Mr. J. Bond, the Gas Engineer, the Gas Committee of the Southport Corporation have decided to adopt slot cooking-stoves, and they have been in operation a few weeks. Since they were introduced, upwards of 200 orders have been booked. The consumer pays 1d. for 24 cubic feet of gas in Southport, and 1d. for 21 cubic feet in Birkdale, including the use of the stove. Qualified men are visiting the whole of the houses in Southport and Birkdale and the district, and are making a thorough examination of the fittings, meters, and gas-stoves, and testing the gas supply.

New Issues of Gas and Water Stocks.—Among the principal new issues of stock offered by tender in the first half of this year were the following: Bournemouth Gas £10 7 per cent. "B" shares, £10,000; Grand Junction Water 3½ per cent. redeemable debenture stock, £100,000; Lambeth Water 3 per cent. debentures, £70,000; Newcastle and Gateshead Gas ordinary stock, £50,000; Newcastle and Gateshead Water maximum 7 per cent. ordinary stock, £100,000; Southwark and Vauxhall Water 3 per cent. debenture stock (intercommunication and "B") £260,000; Staines Reservoirs 3 per cent. guaranteed debenture stock, £20,000; West Ham Gas 4 per cent. perpetual debenture stock, £33,300; do. 5 per cent. preference stock, £100,000; West Surrey Water £10 ordinary shares, £8000.

Trouble with Gas-Irons.—Referring to this subject, which was mentioned in the "JOURNAL" last week (p. 63), a "Manufacturer's Assistant" writes to the "Ironmonger" as follows: "With regard to internally-heated gas-irons, it does not seem to be generally appreciated that the only proper way of dealing with a complaint is to see and test the gas-iron as fitted and used by the customer. All gas-heated appliances require to be fitted and used under proper conditions; and anyone with experience from a manufacturer's point of view is forced to the conclusion that the bulk of the complaints about gas-irons and kindred appliances are due to the want of such conditions. The general method adopted by an ordinary customer is to attach a gas-iron with a piece of rubber tubing to the kitchen pendant or to a lighting bracket. This frequently means trouble, either from the want of a proper volume of gas at a maintained pressure, or through kinking of the tube. A good way to fix is with a short stem-pipe from the ceiling, fitted with a swivel-joint. This allows a straight drop for the flexible tubing to the iron. If rubber tubing is used, this should be without wire inside."

IMPORTANT

NOTICE AND CAUTION.

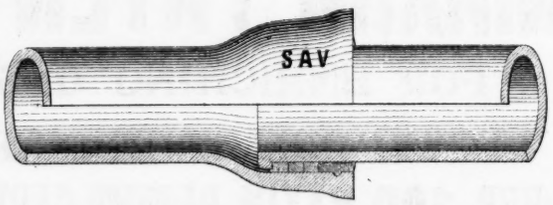
VERTICALLY CAST IRON PIPES.

It has been recently brought to our notice that a Firm has been offering Pipes as of **French Manufacture,** when the origin is of another Country, where the product is not as reliable as that of **Society D'Aubrives, Ardennes, France.**

The Directors are anxious to protect their **Clientele** from imitations which are offered under false representations, and to call the attention of Engineers to their **Brand**—

"S.A.V."

which is cast on the Sockets of all Pipes made **under their Patent Clarifying Process.**



The Society has a universal reputation for the excellence of their product, and by the kind assistance of Engineers, notifying to the Company, or their Agent direct, their intention to buy French Pipes, any attempt to substitute inferior material will be avoided.

Please address all communications to:

A. G. CLOAKE (British Agent),
54, HOLBORN VIADUCT, LONDON.
TELEGRAMS:—"Amour, London."
TELEPHONES: 1890 Holborn, and 194 Central.

WORKS ADDRESS:
THE SOCIETY D'AUBRIVES,
ARDENNES, FRANCE.

Norwich Water Company.—The report adopted at the recent half-yearly meeting of the Norwich Water-Works Company stated that after carrying £5000 to a contingency fund, and providing for the payment of working expenses, debenture interest, and the dividend on the preference shares, there remained a sufficient sum to pay a dividend on the ordinary shares at the rate of 6 per cent. per annum, less income-tax, and leave £7229 to be carried forward. The business of the Company continues to increase in a very satisfactory manner.

Gas and Electricity at Stockton Heath.—The Warrington Corporation recently wrote asking the views of the Stockton Heath Parish Council upon the question of their applying for parliamentary powers to supply electricity in the district; and after considering the matter, the Council replied that they were not opposed to the Corporation doing so, provided the price to consumers, both for electricity and gas, should never be more than was from time to time charged in Warrington. At a meeting of ratepayers, this reply was, after a long discussion, approved of by a majority of 17 votes to 12.

Gas-Fire Rents at Stafford.—The Stafford Town Council have adopted a recommendation of the Gas Committee that the charges for the hire of gas-fires should be reduced by half, in order to encourage their more general use. Mr. Bedford objected to the reduction while there was such a large overdraft at the bank, and considered that it would only benefit the quarterly consumers, who could afford to pay the full price. Mr. Simmons, however, pointed out that many of the prepayment consumers had gas-fires; and the Chairman (Alderman Lovatt) said it was out of consideration for this class that the proposal had been brought forward.

Reductions in Price.—The Gas Committee of the Workington Corporation have decided to recommend a reduction in the price of gas from 2s. 8d. to 2s. 6d. per 1000 cubic feet, with a corresponding concession to prepayment consumers. At the annual meeting of the Kenilworth Gas Company last week, a dividend of 6 per cent. was declared, and a reduction of 3d. per 1000 cubic feet in the price of gas was decided upon. As from the 1st inst., the price of gas in Kilkenny will be 5s. per 1000 cubic feet; being a reduction of 9d. For gas supplied through a separate meter, and used for cooking, heating, and motive power, the charge remains at 3s. 9d. As the result of a satisfactory year's working at Hindley, the price of gas has been reduced 5d. per 1000 cubic feet. At Stockport, the Gas Committee have made a reduction of 3d. per 1000 cubic feet to ordinary consumers, to come into force in September.

Turin Gas Company.—The report of this Company for the year 1903 states that there was an increase of 1,052,397 cubic metres, or about 36 million cubic feet, in the total quantity of gas sold, compared with the previous year. Various improvements were made in the plant with the view to a greater production of gas and residual products. Mention is made of the approaching expiration of various concessions; those at Turin and Palermo terminating on the 31st of December next. Excellent results were obtained by the Associated Companies. A sum of 50,000 lire (£2000) was set aside for pensions and subscription to the National Provident Bank. The year closed with a profit balance of 1,096,417 lire (£43,857) which, after deduction of statutory expenses, allowed of the payment of a dividend of 25 lire (£1) per share, half of which was paid in October. At the meeting of shareholders, the report was adopted and the dividend declared.

The New Water-Works at Honiton.—A report was presented to the Honiton Town Council last Wednesday from Messrs. Beesley, Son, and Nichols, the Engineers for the new water-works, certifying that the work was complete, and recommending the payment of the balance of the sum due to the Contractor, less the retention-money. With regard to complaints of insufficient supply in certain parts of the town, it was pointed out that this was probably due to corrosion and leakage of the old mains; and the Engineers recommended that larger pipes should be laid in accordance with their original plan. The Surveyor reported that there was leakage from the filter-bed and regulating-tank as well as in one of the new pipes. After considerable discussion, it was decided to inform the Engineers of these leakages, and to again call attention to the unsatisfactory supply to part of the town, and meanwhile not to accept the certificate of completion.

Maintenance of Burners and Gas-Stoves in Scotland.—The Directors of the St. Andrews Gas Company have just taken a step which shows that they are determined to be abreast of the times in all matters tending to strengthen their relations with the existing consumers, and add to the number of those who now enjoy the advantages of a supply of gas. On the recommendation of the Managers (Messrs. J. & R. Hall) they have decided to adopt a scheme of maintenance, and to appoint a qualified man as inspector to attend to complaints generally, clean and adjust incandescent burners, and see to the proper working of stoves, fires, and other gas appliances now in use. This service they intend to give absolutely free; charging the current rates for all goods supplied. The consumers have been informed of the arrangement by means of a circular, and they have been provided with post-cards for use in intimating complaints or making requests for attention.

Water-Gas Plant for Rochdale.—The Rochdale Gas and Electricity Committee are recommending the Town Council to provide a water-gas installation, at an estimated cost, together with new buildings, of about £15,000. The proposal is that a portion of the old retort-house should be pulled down and rebuilt to provide accommodation for the plant. The money will be taken from the gas-works reserve fund, so that no call on the rates will be necessary. The reserve stood at £21,971 on March 31 last; but it will be remembered that at the budget meeting of the Council in May it was decided to take £5238 (the cost of the street lighting for the year) from this amount—leaving a balance more than sufficient to meet the cost of the new scheme. The present proposals are not an alternative to the plan the Committee have long had in mind for entirely rebuilding the old retort-house. Only a portion of it will be used for the water-gas plant, of which there are to be two sets, each capable of producing 750,000 cubic feet per day. The remainder of the house will be renewed when the reserve fund is sufficiently large to permit of this being done.

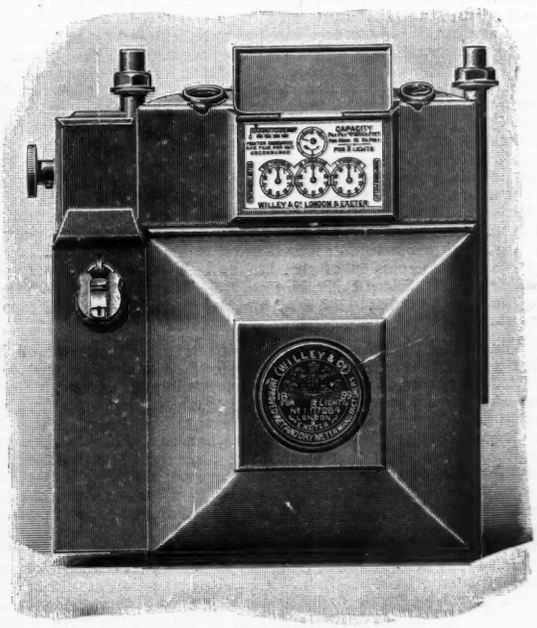
THREE POINTS

of advantage from the many found in our Slot Meters are:

1st.—They are Fraud Proof, and Cannot be tampered with through the Slot.

2nd.—The Slot is closed when the maximum number of Coins have been inserted.

3rd.—Our Price-Changing System is the Simplest, Quickest, and most Accurate yet devised.



ALL PARTS INTERCHANGEABLE.

Tens of Thousands in use, and adopted exclusively by many Gas Companies.

WILLEY & CO., LTD., LONDON & EXETER.

Llanelly Public Lighting Question.—In order to put an end to their long-standing dispute with the Gas Company, the Llanelly Urban District Council have intimated that unless a settlement is arrived at the contract will at once cease. They have already made arrangements to light the streets with oil-lamps. The charge of the Company is 4s. 2d. per 1000 cubic feet; and the dispute is over the price.

Gas Profits at Workington.—The statement of accounts of the Workington gas undertaking for the year ending March 31, shows that the income amounted to £16,151, and the expenditure to £12,602, yielding a gross profit of £3549. The net profit was £1036. The number of ordinary meters in use has decreased from 2083 to 2003; while slot meters increased from 622 to 1097. The Gas Committee have recommended that the price of gas be reduced to ordinary customers from 2s. 8d. to 2s. 6d. per 1000 cubic feet. Prepayment consumers are to have 30 cubic feet of gas for 1d., instead of 20 feet.

Stockport Corporation Gas Supply.—At the meeting of the Stockport Town Council last Wednesday, Alderman W. Lister, the Chairman of the Gas Committee, in moving the adoption of their minutes, drew attention to the fact that the result of last year's working was most satisfactory—being the second best to any he remembered since he had been connected with the Committee. The gross profits amounted to £32,387. From this sum had to be deducted various items (including £500 which paid off a loan of £6000), amounting in all to £18,302; leaving a net profit of £14,085. It had been decided to hand over to the Finance Committee, in relief of the rates, a sum of £11,200; and the remainder was placed to the reserve fund, which now amounts to upwards of £3000.

Colchester Water Supply.—At the meeting of the Colchester Town Council last Wednesday, the Water Committee submitted the annual statement of accounts to March 31 last, showing a net profit on the year's working of £2700, which, added to the balance brought forward, made a total of £6111. The gross revenue had increased by £1144, and the net profit by £187. This was accounted for by the fact that the revenue account had had to bear an expenditure of £894 on renewals of mains. In moving the adoption of the report, Alderman Wicks said the figures would speak for themselves. It was gratifying to find that the water-works proved increasingly remunerative and progressive, and the apportionment to the general relief of the rates now amounted to nearly £10,000 derived from the undertaking. The report was adopted.

Fatal Gas Explosion at Sunderland.—An explosion of gas occurred at the Wheatsheaf Inn, Sunderland, on the 13th ult., by which several persons were injured. Among them were two men named Wakefield and George, who had to be removed to the Infirmary, where they succumbed. At the adjourned inquiry held by the Deputy-Coroner (Mr. Salkeld) last Thursday, evidence was given as to a strong smell of gas pervading the house about twelve o'clock on the morning of the above-named day. After searching for the escape, a match was struck, and an explosion followed in the sitting-room, where there was a three-light chandelier which had not been properly watered. The Deputy-Coroner, in summing up, said that in accidents of this kind there was always carelessness, though in the present instance there was no culpable negligence shown. The cause of the explosion seemed to lie between the fact of not putting water into the chandelier and not turning the gas off at the meter at night. After consulting in private, the Jury returned a verdict that death was due to burns accidentally received in an explosion of gas, but how the explosion was caused there was not sufficient evidence to show. They suggested, however, that the landlord should look after his gas-lights in future, and turn off the gas at the meter every night.

The Omagh Award.—Some discussion on the question which has arisen as to the award in the arbitration for determining the price to be paid for the gas-works, took place at the meeting of the Omagh Urban Council on Monday of last week. Mr. Cadden, in giving notice of motion that the resolution to traverse the award be rescinded, and that the Council further discuss the matter when the Arbitrator has gone into the figures, said that in the first place he was not clear as to whether they had any right to traverse or not; and even if they had, he was not sure they would improve their position. Even if the case came before a Common Jury or a Petty Jury at any assize in County Tyrone or elsewhere, and they considered that the price was too high, it would seem unreasonable that the Company should be bound by this decision—they ought to have power to appeal. Mr. Cadden was continuing his remarks, when the Chairman interposed with the suggestion that it would be better to leave the matter until the resolution was proposed. He had been informed that in any case the traverse could not be dealt with before the March assizes; and the works could not be taken over till the matter was settled. Mr. Cadden having replied that he was most anxious for the transfer to take place on Dec. 31, the matter dropped.

Morecambe Corporation Gas Supply.—The following particulars in regard to the working of the Gas Department of the Morecambe Corporation in the past financial year were supplied by the Engineer and Manager (Mr. J. R. Duff) to a local paper: The total receipts on revenue account were £16,945, and the total expenditure was £7866; leaving a gross profit of £9079. Against this were the annual charges on capital account amounting to £9980; showing a net loss of £901. The total expenditure on capital account for the year was £4941, making the present capital account £178,632. The total revenue from gas amounted to £13,181, or an increase of £678 over the previous year. The cost of producing gas was 1s. 1·77d. per 1000 cubic feet, compared with 1s. 3·33d. previously. The quantity of gas made was 79,123,000 cubic feet; being increase of 1,972,000 cubic feet, or 2·55 per cent. The average cost of coal per ton carbonized was 11s. 7·35d., against 12s. 11·14d., less residuals, which produced 8s. 1·53d., against 7s. 7·85d.; making the cost 3s. 5·82d., against 5s. 3·29d. The gas sold was 71,466,400 cubic feet; being an increase of 4,023,900 cubic feet, or 5·63 per cent. The quantity consumed by the slot-meter system was 13,663,700 cubic feet, an increase of 4,253,300 cubic feet. The receipts for coke and tar showed a substantial increase over the previous year.

The "MAIN"

Gas Cooker

WITH LATEST DEVELOPMENTS.

SPECIAL FEATURES.

OUR NEW PATENT ENAMEL is guaranteed free from Lead or other Poisonous Chemicals.

Inside Fittings, Porcelain Enamelled.

Can be supplied with Moveable Burners, if desired.

R. & A. MAIN, LTD.,

LONDON: 49, Queen Victoria Street. | GLASGOW: 26, West Nile Street. | FALKIRK: Gothic Works.

A Comparison that is Odious – to Electricians.—The "Faversham Mercury" of Saturday's date contained the following significant paragraph: "The Nernst electric lamps in the streets were lit for the first time on Friday evening. Up to the present, the light given has been most disappointing; and it certainly cannot be compared with the splendid light given by the incandescent gas-lamps. The great fault with these electric lamps seems to be the want of diffusing the light all round; but perhaps this will be remedied as time goes on."

Inverted Gas Lighting at the Italian Exhibition.—The "Electrophone" building in the grounds of the Italian Exhibition, Earl's Court, adjoining the Welcome Club, is lit on the outside by 33 "Globe Light" burners, and inside by four pendants of 3 burners each. That the lighting is a great success, may be gathered from the following extract from a letter written by the Managing-Director of the Electrophone Company, under date of June 1: "The gas consumed from the 11th ult. (the date the exhibition opened) to the 30th ult. was 6000 feet, the cost being 18s.; an average of about 1s. per night. As the lighting of our building is, I consider, the most effective in the exhibition, the smallness of the cost is amazing."

Painful Sequel to the Trouble at West Bromwich.—At the meeting of the West Bromwich Town Council on Wednesday, the report of the Electric Lighting and Power Committee, dealing with the trouble at the electricity works and the allegations made by the employees against the Chairman (Alderman Pitt), to which reference was made last week, was considered at some length. Alderman Blades expressed the opinion that the Chairman had been unfairly treated in the employees' memorial, and that the Committee had shirked their duty. He moved that the matter be referred to the General Purposes Committee, so that an opportunity might be afforded to the accused of removing the charges hanging over him. Alderman Pitt strongly repudiated the accusations. Ultimately the matter was referred to the General Purposes Committee for re-consideration. Subsequently, while the Council were discussing other business, Alderman Pitt fell heavily from his chair. He was removed from the Council Chamber in an unconscious condition, and was attended by two medical men. He regained consciousness after a time; but his medical adviser has ordered him complete rest for six months.

Electric Lighting Charges at Rathmines.—At the last meeting of the Rathmines Urban District Council, attention was drawn to an apparent loss of £955 on the past year's working of the electric light undertaking, though they were supplying current to the consumers at 4½d. per unit, while the cost of production was only 3·87d. The member who drew attention to the matter said that when a municipal body entered on an enterprise of this sort, it ought to be governed by the principles regulating ordinary trading concerns. He found that the public lighting was charged at only 2·7d. per unit, while it cost 3·8d. to produce; so that there was a loss of nearly 1¼d. on each unit. He suggested that they should charge for the public lighting at the same rate as that paid by private consumers. If they did this, the total credit for public lighting last year would not be £2979, but would amount to £4965; and instead of showing a loss of £955, there would be a balance in favour of £1034. He maintained that 4½d. per unit was a reasonable charge for public lighting, especially when it was remembered that in many London suburbs it was 6d. The matter was eventually referred to the Committee for a general reorganization of the charges.

Misleading Electricity Meters.—In moving the adoption of the report of the Electricity Committee at last week's meeting of the Aston Town Council, Mr. Godrich referred to the Committee's actions as to the complaints of a number of consumers of electric light, who considered that they had been overcharged. He thought that the consumers acted in a sensible manner when they instructed an outside expert to see the meters. This gentleman having inspected them, agreed that the division record, as indicated on the meters, had to be multiplied by four, in order to determine the number of units which had been used. He (Mr. Godrich) regarded it as a departmental blunder in not giving information to the consumers as to the way in which the meters should be read. At the same time, the Committee recognized that they had ground for complaint; and they were willing to make allowances to consumers who could conclusively satisfy them that they had burnt the light in ignorance, or had been misled by the meters. The Committee had agreed to make certain allowances, with 25 per cent. as a maximum. Several members criticized the Committee at length, which prompted the Mayor to appeal to the Council to adopt more business-like methods, and not to cry "stinking fish." The Council having gone into municipal trading, it was policy not to advertise blunders. They should be kept to themselves, if they hoped to keep the confidence of the public. The report was approved.

The Works Committee of the Southport Water Board have recommended that the tender of Messrs. Holme and King, Limited, be accepted for the construction of their new reservoir at Gorse Hill, and that the work be commenced forthwith.

Under the auspices of the Southport Corporation Gas Department, an exhibition of gas appliances is being held this week in the Town Hall, Birkdale, by John Wright and Eagle Range, Limited. Miss M. Lovell gives lectures and cookery demonstrations.

The Lighting Committee of the Lambeth Borough Council have given instructions, at the suggestion of the South-Eastern and Chatham Railway Company, for the lamps belonging to them in the vicinity of Brixton Station to be converted to the incandescent gas system.

The Ash-next-Sandwich Gas Company have placed the order with Messrs. Robert Dempster and Sons, Limited, of Elland, for the gasholder recently advertised for. The work is to be carried out under the supervision of Mr. F. Higginson, of Broadstairs, the Consulting Engineer to the Company.

Messrs. F. C. Sugden and Co. have had placed with them orders by the New Tredegar Gas and Water Company, Limited, and the Drighlington and Gildersome Gas Company for deep and semi-deep regenerator settings respectively, and a repeat order for shallow regenerator settings by the Audley Urban District Council.

THE

PARKINSON

"CROWN"

COOKER

SHOWING HOT-PLATE

HINGED TO FACILITATE

CLEANING OF BURNERS, &c.

PARKINSON AND W. & B. COWAN, LTD.

(*Parkinson Branch*),

COTTAGE LANE, CITY ROAD, LONDON. | BELL BARN ROAD, BIRMINGHAM.

APPLICATIONS FOR LETTERS PATENT.

14,422.—THORP, T., "Chimney protector for gas." June 27.
14,439.—CHARLTON, T. E., "Gas-burners." June 27.
14,445.—BOULT, A. J., "Purifying gas." A communication from C. S. Lomax. June 27.
14,465.—KLEIN, J. D. L., "Purifying gas." June 27.
14,488.—COX, H. B., "Burners." June 27.
14,563.—WARREN, W. P., and SKINNER, W., "Generating gas." June 28.
14,574.—SCHNEEMANN, A., "Incandescent burner." June 28.
14,580.—SCHOOB, I., "Incandescent burners." June 28.
14,581.—SCHOOB, I., "Mantles." June 28.
14,597.—SMITH, F. S. & J. H., "Time switches for gas." June 29.
14,600.—JEFFREYS, E. A., "Incandescent burners." June 29.
14,665.—ROESSLER, A. C., and the SCOTT-SNELL SELF-INTENSIFYING GAS-LAMP COMPANY, LTD., "Street-lamps." June 29.
14,666.—SNELL, F. A., GOODRIDGE, R. H., and the SCOTT-SNELL SELF INTENSIFYING GAS-LAMP COMPANY, LTD, "Incandescent gas lighting." June 29.
14,702.—PALMER, A., MOORE, A. E., and DARCH, A., "Incandescent burners." June 30.
14,718.—CARPENTER, C. C., "Gasification of coal." June 30.
14,757.—THWAITE, B. H., "Rendering blast-furnace gases available or working engines." June 30.
14,764.—WARRY, J., and ARCULUS, G. N. & E. A., "Glass-shade for inverted incandescent gas-lights." June 30.
14,781.—CROSSLEY, W. J., and ATKINSON, J., "Elastic fluid pressure turbines." July 1.
14,819.—HENNIGER, E. H., "Gas-heater for irons." July 1.
14,857.—DEMPSTER, R, and SONS, LTD., and BROADHEAD, J. W., "Feeding coal, ashes, refuse, or other materials, to bucket conveyors or the like." July 2.
14,858.—DEMPSTER, R., and SONS, LTD., and BROADHEAD, J. W., "Feeding hoppers for furnaces and the like." July 2.
14,879.—HARRIS, H. W., "Lighting and extinguishing gas at predetermined times." July 2.
14,896.—NUTTING, J., "Boilers for gas-stoves." July 2.

Messrs. Kirkham, Hulett, and Chandler, Limited, have received an order from the Mountain Ash Urban District Council for a patent "Standard" washer-scrubber for dealing with 300,000 cubic feet of gas per day.

Messrs. Julius Norden and Co. (the United Chemical Works) are exhibiting, at the Ironmongery Exhibition, the process of manufacturing incandescent mantles. This should be a very popular display. Their stand is No. 21.

A new Company has been formed, with headquarters at Rome, under the title of "Società per imprese d'Illuminazione." The capital is 1,250,000 lire (£50,000), in shares of 100 lire (£4), of which about one-third have been already taken up. The main object is to undertake street lighting by gas, electricity, and other systems, in Italy and elsewhere.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 97.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	Apl. 14	10½	Alliance & Dublin 10 p.c.	19½–20½	−½	5 2 5
100,000	10	,,	7½	Do. 7 p.c.	13–14	..	5 7 2
200,000	5	May 12	6½	Bombay, Ltd.	6–6½	..	5 4 0
140,000	5	,,	6½	Do. New, £4 paid	4⅜–5¼	..	4 18 11
380,000	Stk.	Feb. 25	12	Brentford Consolidated	242–247	..	4 17 2
300,000	,,	,,	9	Do. New	182–187	..	4 16 3
50,000	,,	,,	5	Do. 5 p.c. Pref.	127–132	..	3 15 9
206,250	,,	June 10	4	Do. 4 p.c. Deb.	102–105	..	3 16 2
220,000	Stk.	Mar. 10	10½	Brighton & Hove Orig.	212–217	..	4 19 1
246,320	,,	,,	7½	Do. A. Ord. Stk.	150–155	..	5 0 0
460,000	20	Apl. 14	10	British	38⅛–39⅛	..	5 1 3
100,000	Stk.	Feb. 25	6	Bromley, Ord. 5 p.c.	110–120	..	5 0 0
165,700	,,	,,	4½	Do. do. 3½ p.c.	90–95	+½	4 14 9
500,000	10	May 12	7	Buenos Ayres (New) Ltd	10¾–11¼	..	6 4 5
250,000	Stk.	June 29	4	Do. 4 p.c. Deb.	92–94*	..	4 5 1
150,000	20	Mar. 10	8½	Cagliari, Ltd.	21–23	..	7 3 6
100,000	10	May 27	10	Cape Town & Dis., Ltd.	14–15	..	6 13 4
50,000	50	May 3	6	Do. 6 p.c. 1st Mort.	51–53	..	5 13 2
1,375,000	Stk.	Feb. 25	5⅛	Commercial 4 p.c. Stk.	110–114	..	4 11 3
536,485	,,	,,	5	Do. 3½ p.c. do.	106–109	..	4 11 9
442,947	,,	June 10	3	Do. 3 p.c. Deb. do.	85–87	..	3 9 0
800,000	Stk.	June 10	7	Continental Union, Ltd.	110–115	..	6 1 9
200,000	,,	,,	7	Do. 7 p.c. Pref.	142–147	..	4 15 3
575,000	Stk.	Feb. 25	5½	Crystal Palace Ord. 5 p.c.	118–123	..	4 6 8
60,000	,,	,,	5	Do. 5 p.c. Pref.	120–125	..	4 0 0
112,533	,,	Jan. 14	5	Do. 5 p.c. Deb. Stk.	135–140	..	3 11 5
486,090	10	Jan. 28	11†	European, Ltd.	19–20	..	5 10 0
354,060	10	,,	11†	Do. £7 10s. paid	13¾–14¾	..	5 13 10
15,243,200	Stk.	Feb. 11	4⅛	Gas-light and Coke: 4 p.c. Ord.	94–96	+1	4 11 8
2,600,000	,,	,,	3½	Gas-light and Coke: 3½ p.c. max.	89–91	..	3 16 11
3,799,735	,,	,,	4	Gas-light and Coke: 4 p.c. Con. Pref.	108–111	..	3 12 1
4,193,975	,,	June 29	3	Gas-light and Coke: 3 p.c. Con. Deb.	£8–96*	..	3 6 8
258,740	Stk.	Mar. 10	5	Hastings & St. L. 3½ p.c.	90–95	..	5 5 3
70,000	10	Apl. 28	11	Hongkong & China, Ltd.	15–16	..	6 17 6
3,800,000	Stk.	May 12	10	Imperial Continental	202–205	..	4 17 7
473,600	Stk.	Feb. 11	3½	Do. 3½ p.c. Deb. Red.	97–59	..	3 10 8
165,242	Stk.	Mar. 10	6	Lea Bridge Ord. 5 p.c.	113–118	..	5 1 8
561,000	Stk.	Feb. 25	10	Liverpool United A	216–217	+1	4 12 2
718,100	,,	,,	7	Do. do. B	161–163	+2	4 5 11
306,083	,,	June 29	4	Do. do. Deb. Stk.	106–108*	..	3 14 1
75,000	5	June 29	5	Malta & Medn., Ltd.	4–4⅛*	..	5 11 1
560,000	100	Apl. 5	5	Met. of 5 p.c. Deb.	102–105	..	4 15 3
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	10›–102	..	4 8 3
541,920	20	May 27	3½	Monte Video, Ltd.	9–10	..	7 0 0
1,515,892	Stk.	Feb. 26	4½	Newc'tle & G'tesh'd Con.	105–107	..	4 4 1
405,025	Stk.	July 1	3½	Do. 3½ p.c. Deb.	91½–92½*	..	3 15 8
300,000	Stk.	May 12	8	Oriental, Ltd.	138–143	..	5 11 11
600,000	5	Mar. 29	7	Ottoman, Ltd.	5⅞–6⅛	..	5 12 0
					*Ex div.		

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
535,005	Stk.	—	6½	Ply'mth & St'house 5 p.c	—	..	—
851,070	10	Apl. 28	7	River Plate Ord.	10¾–11¼	..	6 4 5
300,000	Stk.	June 29	4	Do. 4 p.c. Deb.	93–95*	..	4 4 3
250,000	10	Mar. 29	7	San Paulo, Ltd.	10½–11⅛	..	£ 1 9
135,000	Stk.	Mar. 10	10	Sheffield A	237–239	..	4 3 8
209,984	,,	,,	10	Do. B	236–238	..	4 4 0
523,498	,,	,,	10	Do. C	234–236	..	4 4 9
116,106	Stk.	—	5	Shrewsbury Ord. 5 p.c.	—	..	4 10 11
6,150,000	Stk.	Feb. 11	5⅓	South Met., 4 p.c. Ord.	125–127	..	4 3 11
1,832 700	,,	Jan. 14	3	Do. 3 p.c. Deb.	89–91	..	3 5 11
300,940	Stk.	May 12	5	Southampton Ord.	105–110	..	4 10 11
87,950	,,	—	4	Do. 4 p.c. Deb.	—	..	—
120,000	Stk.	Feb. 25	6	Tottenham and Edmonton: A. 5 p.c.	122–125	..	4 16 0
313,020	,,	,,	4½	Tottenham and Edmonton: B. 3½ p.c.	97–102	..	4 8 3
182,380	10	June 10	8	Tuscan, Ltd.	1⅛–8⅜	..	9 2 10
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	96–98*	..	5 2 0
745,872	Stk.	Mar. 10	5	West Ham, 5 p.c. Ord.	97–102	..	4 18 0
				WATER COMPANIES.			
782,322	Stk.	June 29	12	Chelsea, Ord.	360–370*	..	3 4 10
150,000	,,	,,	5	Do. 5 p.c. Pref.	157–6.*	..	3 1 9
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75	142–147*	..	3 1 3
175,785	,,	Mar. 29	4½	Do. 4½ p.c. Deb.	137–142	..	3 3 5
1,720,560	Stk.	Mar. 23	8	East London, Ord.	225–230	..	3 9 7
654,740	,,	June 23	4½	Do. 4½ p.c. Deb.	135–140*	..	3 4 4
1,524,283	,,	,,	3	Do. 3 p.c. Deb.	91–94*	..	3 3 10
700,000	50	June 10	11	Grand Junction: 10 p.c. max.	137–142	..	4 4 6
310,000	Stk.	Mar. 29	4	Grand Junction: 4 p.c. Deb.	122–126	..	3 3 6
708,000	Stk.	Feb. 25	10	Kent	325–335	..	2 19 8
160,000	,,	,,	7	Do. New, 7 p.c. max.	230–240	..	2 18 4
1,043,800	100	June 29	11	Lambeth, 10 p.c. max.	320–325*	..	3 7 8
476,200	100	,,	8½	Do. 7½ p.c. max.	235–240*	..	3 10 0
550,000	Stk.	Mar. 29	4	Do. 4 p.c. Deb.	120–125	..	3 4 0
500,000	100	Feb. 25	10	New River, New Shares	—	..	—
1,000,000	Stk.	Jan. 28	4	Do. 4 p.c. Deb.	122–126	..	3 3 6
902,300	Stk.	June 29	7½	South-wark: Ord.	280–285*	..	2 12 7
126,500	100	,,	7½	South-wark and Vauxhall: 7½ p.c. max.	215–225*	−5	3 6 8
489,200	Stk.	,,	5	South-wark and Vauxhall: 5 p.c. Pref.	145–150*	..	3 6 8
1,019,585	,,	Mar. 29	4	Vauxhall 4 p.c. A Deb.	120–125	..	3 4 0
1,155,066	Stk.	May 27	10	West Middlesex	303–308	..	3 4 10
200,000	,,	June 10	4½	Do. 4½ p.c. Deb.	137–142	..	3 3 5
200,000	,,	Mar. 10	3	Do. 3 p.c. Deb.	91–94	..	3 3 10
					*Ex div.		

† Next dividend will be at this rate.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

DRAUGHTSMAN. No. 4234.
WORKING FOREMAN (Sulphate of Ammonia Works). No. 4229.
TRAVELLER. No. 4231.
JUNIORS. S. Cutler and Sons, Millwall.
STOKER. Chepstow Gas-Works.

Situations Wanted.

AS LADY'S HELP BY GAS MANAGER'S DAUGHTER. No. 4233.
ASSISTANT MANAGER. No. 4178.
EXPERT ON LEAKAGE. No. 4232.
METER INSPECTOR AND COLLECTOR. No. 4325.

Plant, &c., for Sale.

IRON ROOF PRINCIPALS, &c. Bournemouth Gas and Water Company.
PURIFIER AND TAR-EXTRACTOR, Cannock, Hednesford, &c., Gas Company.
PURIFIERS. Neston Gas-Works.

Plant, &c., Wanted.

PHOTOMETER. Barnard Castle Gas-Works.
PURIFIERS. Stevenston Gas-Works.
PURIFIERS (Two). Alton Gas Company.

Stocks and Shares.

NUNEATON GAS COMPANY. July 26.

TENDERS FOR

Chemical Works, Lease of.

GLASGOW GAS DEPARTMENT. Tenders by July 20.

Coal.

MORECAMBE GAS DEPARTMENT. Tenders by July 30.
OLDBURY GAS DEPARTMENT. Tenders by July 16.
SAFFRON WALDEN UNION. Tenders by July 18.
SHIFNAL GASLIGHT COMPANY. Tenders by July 22.
TEIGNMOUTH GAS DEPARTMENT. Tenders by July 19.

Creosote Oil.

LEIGH GAS DEPARTMENT. Tenders by July 18.

Lime.

HEYWOOD GAS DEPARTMENT. Tenders by July 19.

Pipes and Fittings.

HEYWOOD GAS DEPARTMENT. Tenders by July 19.

Pitch.

LEIGH GAS DEPARTMENT. Tenders by July 18.

Sulphuric Acid.

HEYWOOD GAS DEPARTMENT. Tenders by July 19.

Tar and Ammoniacal Liquor.

GLASGOW GAS DEPARTMENT. Tenders by July 20.
HEYWOOD GAS DEPARTMENT. Tenders by July 19.
LEIGH GAS DEPARTMENT. Tenders by July 18.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

United Kingdom: One Year, 21s.; Half Year, 10s. 6d.; Quarter, 6s. 6d.
Payable in Advance. If credit is taken, the charge is 25s. a year.
Abroad (in the Postal Union): £1 7s. 6d., payable in Advance.

All Communications, Remittances, &c., to be addressed to
WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

OXIDE OF IRON.

O'NEILL'S OXIDE has a larger annual sale than all other Oxides combined.

SPENT OXIDE purchased in any district.

GAS PURIFICATION & CHEMICAL CO., LD.

JOHN WM. O'NEILL, Managing Director,

PALMERSTON HOUSE, LONDON, E.C.

WINKELMANN'S

"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London E.C. "Volcanism, London."

BROTHERTON & CO., LIMITED.
Offices: Commercial Buildings, LEEDS.
Correspondence invited.

SPENT OXIDE.

THE South Metropolitan Gas Company are always open to receive OFFERS of SPENT OXIDE.
Chief Office: 709, Old Kent Road, London, S.E.
Telegrams: "METROGAS, LONDON."

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.
BROTHERTON AND CO., LTD., Chemical Manufacturers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

TO GAS AND WATER OFFICIALS.

MELROSE CYCLES and Slot Copper COLLECTORS. Latest Design and lowest Prices. For Cash or gradual payments. Catalogue free.
MELROSE CYCLE COMPANY, COVENTRY.

COAL GAS TAR wanted.
ROBINSON BROTHERS, LIMITED. Works: WEST BROMWICH, KNOTTINGLEY, and SPONDON.

ATTERTON'S Patent Charging Machine, especially adapted for Small Works up to 50 Millions. Nearly 40 already supplied, and still supplying. Would soon repay for small outlay. Increased make and reduction in cost.
Apply to E. PADFIELD AND CO., 96 & 98, Leadenhall Street, LONDON, E.C.

GAS TAR wanted.
BROTHERTON AND CO., LTD., Tar Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SPECIAL PAINT FOR GAS-WORKS.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.
Telegrams: "ENAMEL." National Telephone 1759.

SULPHATE OF AMMONIA
SATURATORS and LEAD WORK for Sulphate of Ammonia Plants.
For REPAIRS or ALTERATIONS, ring up "0848 BOLTON," or Telegraph "SATURATORS, BOLTON."
Largest Practice and most Up-to-Date Works in Britain.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

COAL GAS TAR wanted.
BEST PRICES GIVEN.
SHARPNESS CHEMICAL COMPANY, LIMITED, Sharpness Docks, GLOS.

PENNY-IN-THE-SLOT WORK.

H. GREENE & SONS, Ltd., are pre- pared to give QUOTATIONS to Gas Companies or Corporations for FITTING UP COMPLETE and CARRYING OUT the WORK in its entirety, either in Iron or Compo.
SURREY ENGINEERING WORKS, BLACKFRIARS ROAD, LONDON, S.E.
Telephone: 1693 HOP. Telegrams: "LUMINOSITY."

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 254 Oldham, and 2412 HOP, London.
Telegrams:—
"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

DUTCH OXIDE OF IRON.

THE First Dutch Bog Ore Co., Ltd., (Eerste Hollandsche Yzererts Maaty), ROTTERDAM.
General Manager (for England and Wales)—
CHARLES E. FRY, LEAMINGTON; and at Tower Chambers, Brown Street, MANCHESTER.
London Managers—
E. PADFIELD & CO., 96-98, Leadenhall Street, LONDON, E.C.
General Manager (for Scotland)—
J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

SULPHURIC ACID.

SPECIALLY prepared for the Manu- facture of SULPHATE OF AMMONIA.
SPENCER, CHAPMAN, AND MESSEL, LIMITED, 36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, LONDON."
Telephone: 341 AVENUE.

JOHN RILEY & SONS, Chemical Manu- facturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 50 Years. References given to Gas Companies.

PATENTS AND TRADE MARKS
PUBLICATIONS. "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

SUTTON GAS COMPANY.

APPOINTMENT OF ASSISTANT WORKS MANAGER.

THE Secretary begs to thank the nu- merous Applicants for the Post, and intimates that the VACANCY HAS BEEN FILLED.

WANTED, by the daughter of a Gas Manager, a situation as HELP to a Lady. She is thoroughly domesticated, understands Cooking and Laundry work by Gas; also General Housework. Can teach Drawing, Paint, and play Piano.
Address No. 4233, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SITUATION wanted in a Gas Office as METER INSPECTOR and COLLECTOR (Security), or as FITTER. Nine Years' General Experience. Good Testimonials.
Address No. 4235, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

LEAKAGE.

EXPERT is open to advise as to the best method of decreasing Leakage. Competent Men sent to all parts of the Country to conduct testing. Results Guaranteed.
Address No. 4232, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

APPOINTMENT wanted as Assistant- MANAGER in Gas-Works. Trained at Engineering Works. Recently prepared Drawings and Superintended erection of large up-to-date Gas-Works. Good knowledge of Chemistry and Gas-Works routine. Honours Gas Manufacture.
Address No. 4178, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Working Foreman to take charge of a small Sulphate of Ammonia Works. Wages £2 10s.
Address No. 4229, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

OXIDE OF IRON.
(NATURAL.)

BALE & CHURCH will be pleased to send Samples and Quotations, and make Offers for SPENT OXIDE.
BALE'S FIRE CEMENT, PAINT, AND GAS COAL.
5, CROOKED LANE, LONDON, E.C.

AMMONIACAL LIQUOR wanted.
BROTHERTON AND CO., LTD., Ammonia Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

DRAUGHTSMAN.

WANTED, an Experienced Man for Experimental Work in High-Pressure Lamps.
Write, giving full Particulars as to Experience and Salary required, to No. 4234, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, at once, a good Stoker, used to Shovel Charging and Engine and Exhauster, for a small Gas-Works. Married man preferred. Twelve Hour Shifts. Wages 26s. in Summer, and 28s. in Winter. Permanency to a good, trustworthy Man.
Apply, stating Age, to the MANAGER, Gas-Works, Chepstow, MON.

WANTED, a set of Four Purifiers, 10 feet square.
Apply GAS-WORKS, STEVENSTON.

WANTED, a Photometer in good working condition, suitable for a small Gas Works. (Annual make 33 Millions.)
Apply to ROBT. WOOD, Gas Office, BARNARD CASTLE.

ALTON, HANTS, GAS COMPANY.

WANTED, Two Second-Hand Gas PURIFIERS, in good condition, from 18 to 20 feet square, to be delivered free at Alton Railway Station.
Tenders to be sent on or before July 31, to the SECRETARY, Alton Gas Company, HANTS.

TAR Contracts Wanted on the Sliding- Scale or at Fixed Prices.
Managers and Secretaries desirous of selling to best advantage, please communicate with DENT AND CO., Ouse Chemical Works, SELBY.

TWENTY New Retorts, 22 in. by 14 in by 10 ft. long over all. Ingham's (Wortley) make. Cheap to Clear.
FIRTH BLAKELEY, Thornhill, DEWSBURY.

GASHOLDER, 40 ft. diameter by 14 ft. deep, in wrought Tank, with six Columns, trellis Girders, and Suspension Gear. In splendid condition. Nearly new.
New GASHOLDER, 40 ft. diameter by 12 ft. deep, with Steel Standards; also new STEEL TANK to contain same.
Write J. WRIGHT, 181, Queen Victoria Street, LONDON, E.C.

GASHOLDERS AND TANKS FOR SALE.

TWO splendid Double-Lift Gasholders, in Cast-Iron Tanks—40,000 and 60,000 cubic feet Capacity respectively, WILL BE SOLD at a sacrifice to immediate purchasers to save carriage. Now being Dismantled, and could be erected for use for the coming Winter if sold at once.
Full Particulars and Photographs on application to FIRTH BLAKELEY AND CO., Gas Engineers, Thornhill, YORKS.

THE Bournemouth Gas and Water Company have the following Wrought-Iron ROOF PRINCIPALS and PURLINS to dispose of:—
Sixteen Principals of 5-in. by 4-in. Rafters, 3-in. by 3-in. Struts, 1¼-in. Tie-Rods, Span 57 ft. 6 in. to ends of Rafters, with Slate Laths, &c., Complete, spaced 6 ft. 2½ in. apart, covering Building 105 ft. by 53 ft., inside walls.
Total Weight approximately 26 Tons.
The above, in condition equal to new.
Apply to H. W. WOODALL, Engineer and General Manager.

CANNOCK, HEDNESFORD, AND DISTRICT GAS COMPANY, LIMITED.

OFFERS invited for One C. & W. Walker's PURIFYING-MACHINE, with TAR-EXTRACTOR, 10-inch Valves and Connections Complete, to pass 200,000 cubic feet of Gas per Twenty-Four hours. The above Machine may be seen working, and is being replaced by a larger one.
By order of the Directors.
T. A. NICHOLLS,
Secretary.
Gas-Works, Cannock.

ROBERT DEMPSTER & SONS, Ltd., Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, Rose Mount Iron-Works, Elland.

FOR SALE—Two 6 feet by 6 feet Purifiers, by Dempster, with two Four-Way Valves. Replaced by larger.
Apply to A. E. Ashley, Manager, Gas-Works, Neston.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. Blakeley, Gas Engineer, Thornhill, Dewsbury.

BOROUGH OF MORECAMBE.
(Gas Department.)

TENDERS FOR COAL.

THE Gas Committee of the above are prepared to receive TENDERS for the supply of 8000 Tons of unscreened GAS COAL for One or Two Years, to be delivered on the Gas-Works Siding, Midland Railway, Morecambe, in the Corporation's own Waggons, or in Colliery Waggons, in such quantities as may be required by the Engineer.

Tenders, specifying the description of Coal, the name of the pit at which it is raised, and the terms for net monthly payments, are to be sent to the undersigned on or before Saturday, the 30th of July, 1904, endorsed "Tender for Coal."

The Gas Committee do not bind themselves to accept the lowest or any Tender.

James R. Duff,
Engineer and Manager.

Market Street, Morecambe,
July 4, 1904.

BOROUGH OF LEIGH.
(Gas Department.)

THE Gas and Water Committee of the above Corporation invite OFFERS for the surplus TAR made at their Gas-Works during the Nine Months ending March 31, 1905. The Corporation are also prepared to receive TENDERS for the supply and delivery of PITCH and CREOSOTE OIL during the same period.

Further Particulars, together with Conditions of Contract and Forms of Tender, may be obtained (on application) from the undersigned.

Sealed and endorsed Tenders must be delivered to Mr. Peregrine Thomas, Town Clerk, Town Hall, Leigh, Lancashire, on or before Twelve o'clock noon on Monday, the 18th day of July.

The Corporation do not bind themselves to accept the highest Tender for Tar or the lowest for Pitch and Oil or any Tender, and reserve to themselves the right to divide any Tender.

James Gibson,
Engineer and Manager.

Gas and Water Offices,
Leigh, July 6, 1904.

URBAN DISTRICT COUNCIL OF OLDBURY.
(Gas Department.)

THE Gas Committee of the Urban District Council of Oldbury are prepared to receive TENDERS for the supply of 12,000 Tons, or thereabouts, of best screened GAS COAL for delivery during the Year ending July 31, 1905, in such quantities and at such times as ordered, carriage free at: (1) Oldbury Basin, Great Western Railway; and (2) London and North-Western Railway, Oldbury.

The Coal must be of first-class quality, well screened, freshly wrought, and perfectly free from Bats, Pyrites, and other Foreign Matter.

Sealed Tenders, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Gas Coal," must be delivered to the undersigned not later than Saturday, the 16th inst.

The Gas Committee do not bind themselves to accept the lowest or any Tender, and reserve to themselves the right to apportion the whole quantity, or part thereof, as they may think fit.

Tender Forms and any further Information may be obtained from the undersigned on application in writing.

By order,
A. Cooke,
General Manager.

Gas-Works, Oldbury,
July 6, 1904.

SHIFNAL GASLIGHT AND COKE COMPANY.

TENDERS FOR GAS COAL.

THE Managing Partners of the above Company are prepared to receive TENDERS for the supply of 1000 Tons, or less, of a good quality of GAS COAL or large NUTS, including carriage to G.W.R. Station, Shifnal, Salop, for a period of Twelve Months from, or about, the end of August next.

Tenders to be accompanied by practical working Analysis.

The Coal and Nuts to be free from Sulphur, Bats, Refuse, or Dirt, and to be weighed upon the Company's Machine.

The supply to be in such quantities weekly as may be ordered by the Clerks to the Company.

Payments will be made from time to time so long as the Contractor shall duly fulfil his contract.

The Managing Partners do not pledge themselves to accept the lowest or any Tender.

Sealed Tenders, endorsed "Tender for Gas Coal," must be delivered at our Offices, Victoria Road, Shifnal, Salop, not later than Friday, the 22nd day of July inst.

By order,
Farmer and Farmer,
Joint Clerks to the said Company.

July 1, 1904.

TEIGNMOUTH URBAN DISTRICT COUNCIL.

THE Gas Committee of the above Council invite TENDERS for the supply of 2600 Tons of best Durham, or other good GAS COAL, screened or unscreened. Same to be supplied to the requirements of the Council, between the 31st day of July, 1904, and the 30th day of June, 1905.

The Coal must be Fresh Wrought and free from all Impurities.

No special Tender Form will be issued.

Tenders must be accompanied by a full Description and practical Working Analysis of the Coals quoted, and may be f.o.b., c.i.f., Teignmouth Harbour, or f.o.r., Teignmouth Railway Station.

Sealed Tenders, endorsed "Gas Coals," to be sent to the undersigned not later than Tuesday, the 19th day of July, 1904.

The Committee do not bind themselves to accept the lowest or any Tender.

By order,
J. Alex. Gray,
Gas Manager.

SAFFRON WALDEN UNION.

TENDERS FOR COAL.

THE Guardians of the above Union are prepared to receive TENDERS for the supply of about 200 Tons of Best Hand-Picked Hard STEAM COAL, and about 15 Tons of COKE for Twelve Months from the 31st inst.

Sealed Tenders, endorsed "Tender for Coal and Coke," to be sent to me, the undersigned, not later than Monday, the 18th inst.

The lowest Tender will not necessarily be accepted.

By order,
Turner Collin,
Clerk.

Saffron Walden, July 7, 1904.

BOROUGH OF HEYWOOD.

THE Gas Committee invite Tenders for the supply of LIME, TUBES and FITTINGS, and SULPHURIC ACID; and also for the purchase of surplus TAR.

Specification and Form of Tender may be obtained from Mr. W. Whatmough, the Gas Manager.

Contractors tendering for this work must pay their workpeople at least the Standard or Trade Union Rate of Wages, and observe the Trade Conditions which attach to the various kinds of work for which the Tender is sent in.

Sealed and endorsed Tenders to be sent to me not later than Tuesday, July 19, 1904.

By order,
Geo. G. Bouchier,
Town Clerk.

Municipal Buildings,
Heywood, June 14, 1904.

GLASGOW CORPORATION.
(Gas Department.)

RESIDUAL PRODUCTS FOR SALE, AND RESIDUAL PRODUCT WORKS TO LEASE.

THE Corporation are prepared to receive TENDERS for the purchase of the TAR and AMMONIACAL LIQUOR produced at their new Provan Gas-Works, and also for a LEASE of their CHEMICAL WORKS at Provan during a period of Five Years, from and after July 1, 1904.

Forms of Tender, on which Offers must be made, and *copies* of the Terms and Conditions upon which the Products are to be Sold, and the Residual Product Works are to be Let, may be had on application to Mr. Alexander Wilson, Gas Engineer, No. 45, John Street, Glasgow; and Offers, endorsed "Tender for Provan Residual Products, &c.," will be received by the Subscriber on or before Wednesday, the 20th curt.

The Corporation do not bind themselves to accept the highest or any Tender.

James G. Monro,
Town Clerk.

City Chambers, Glasgow,
July 4, 1904.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at Mr. Alfred Richards' Offices, 18, Finsbury Circus, E.C.

RAILS.

New and Second-Hand with all Accessories; also Tip Waggons and Turntables.

B. M. RENTON,
MIDLAND WORKS,
SHEFFIELD.

NUNEATON GAS COMPANY.
(Incorporated by Act of Parliament, 49 Vic., Cap. 31.)

ISSUE OF £3200 ADDITIONAL STOCK IN SUMS OF £8 EACH.

MESSRS. COOKSON & SLATER have received Instructions from the Directors to OFFER BY AUCTION, at the Clock Inn, Market Place, Nuneaton, on Tuesday, the 26th day of July, 1904, at Five for Six o'clock in the Evening, subject to Conditions to be then produced,

400 SHARES in the NUNEATON GAS COMPANY,

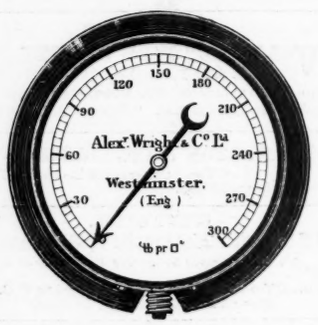
Of the Nominal Value of £8 each, in Lots of Five Shares each, being the issue of £3200 Additional Capital or New Stock authorized by the Nuneaton Gas Order, 1901.

The present Share Capital of the Company consists of £32,552, in 1969 Original Shares of £8 each, and 2100 New Shares, also of £8 each; and there is the sum of £9200 Debenture Stock.

The Standard Rate of Dividend at the rate of £10 per cent. on the Original Shares, and £7 per cent. on the New Shares, has been paid for the past Four Years.

For further Particulars apply to the Auctioneers, Nuneaton; or to F. S. Clay, Solicitor and Secretary to the Company, Nuneaton.

STEAM, OIL, and WATER.



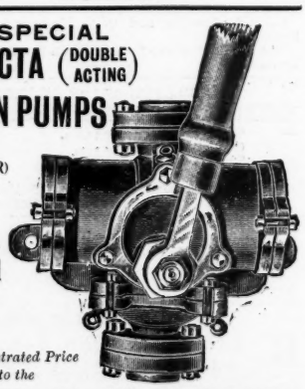
Any Range of Pressure.

Just Published. Crown 8vo, 6s. Cloth.

GAS-WORKS
THEIR
CONSTRUCTION AND ARRANGEMENT
And the Manufacture and Distribution of Coal Gas.
By S. HUGHES, C.E.
Ninth Edition, Revised, with Notices of Recent Improvements.
By HENRY O'CONNOR, A.M.Inst.C.E.,
Author of the "Gas Engineer's Pocket Book."
London: CROSBY LOCKWOOD & SON,
7, Stationers' Hall Court, E.C.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER.
Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.
Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

SPECIAL
PERFECTA (DOUBLE ACTING) PISTON PUMPS
(HAND OR POWER)
FOR
Tar and Ammoniacal Liquor, &c.



Send for Illustrated Price List to the
GEORGE FISCHER STEEL & IRON WORKS,
20, HIGH HOLBORN, LONDON. LTD.,

Chesterfield Gas and Water Board. W. T. Buckland, Engineer.

CHARGING FLOOR OF INCLINED RETORT HOUSE.

6 ARCHES ERECTED IN 1898. REPEAT ORDER FOR 6 ARCHES ERECTED IN 1903 BY

ROBERT DEMPSTER & SONS LTD., ELLAND, YORKS.

Printed for Walter King, by King, Sell & Olding, Ltd.; and published by him at 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, July 12th, 1904.

Collotype by Waterlow & Sons Ltd.

TROTTER, HAINES, & CORBETT, LIMITED,
Brettell's Estate
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: R. CULL, 34, OLD BROAD STREET, E.C.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on Application.

UNEQUALLED.
Gas Companies are solicited to try Samples of the
MIRFIELD
BLACK BED GAS COAL.
Prices and Analysis on application.
MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

HEATHCOTE GAS COAL.
Rich in Illuminating Power and yield of Gas.
Above the Average in Weight and Quality of Coke.
Maintains a High Standard in Residuals.
THE GRASSMOOR CO., LD.,
CHESTERFIELD.

JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,
Manufacture and keep in Stock at their Works (also large stock in London)
PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts, and Covers, and rendering Leakage impossible.

SAVE MONEY LABOUR
Imperial Cookers give no trouble, and for quality and cheapness cannot be excelled.
TWO GOLD MEDALS in Six Months.
Our Gas-Cooker Orders last Year were
455 % (per cent.)
more than in 1902.
THE IMPERIAL STOVE CO.,
LEAMINGTON SPA.
Telegrams: "Imperial, Leamington."
Telephone: One X.

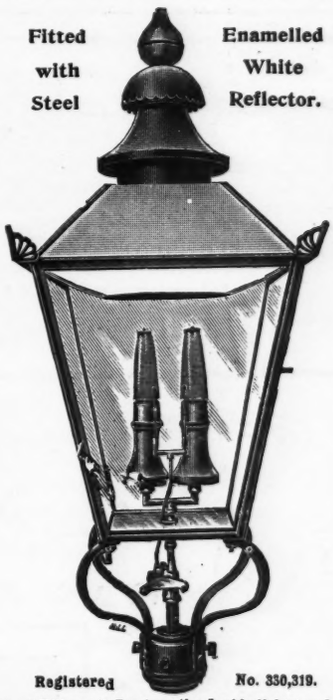
PRICE'S COKE & COAL BARROW

effects a great saving of time, labour, and expense.
For Particulars, Price, &c., apply to Mr. EDWARD PRICE, "Langley," Wyke Avenue, WORTHING.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.
QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY, LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

THE
"ROTARY" STATION METER.
Efficiency Demonstrated.
APPLY—
T. G. MARSH,
MAWSON CHAMBERS, DEANSGATE,
MANCHESTER.

THOMAS TURTON AND SONS, LIMITED,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES, SPANNERS, RATCHET BRACES, LIFTING JACKS, ANVILS, VICES, AND ENGINEERS' TOOLS GENERALLY.
LONDON OFFICE:
90, CANNON STREET, E.C.

THE
"KILBURN" LANTERN.
Fitted with Steel
Enamelled White Reflector.

Registered No. 330,319.
The "Kilburn" Lantern (for double lights) and the "St. Albans" Lantern have been adopted for lighting the Town of St. Helens.
H. GREENE & SONS, Limited,
Surrey Engineering Works,
Blackfriars Road, LONDON.
Telephone 1693 HOP.
Telegrams: "LUMINOSITY LONDON."

NOW READY, pp. 584 & XVI. 251 ILLUSTRATIONS. F'CAP. QUARTO, PRICE 18s. NET (POST FREE).
THE SEVENTH EDITION OF
NEWBIGGING'S HANDBOOK FOR GAS ENGINEERS & MANAGERS
(DEDICATED TO SIR GEORGE LIVESEY).

The Work has been revised throughout, and contains 40 pages of Letterpress and 12 Illustrations more than the last Edition.
In almost every department additions have been made; and it is believed that the labour bestowed on its production will enhance the value of the book as a Work of Reference.

Orders may be sent through any Bookseller, or direct to the Publisher, WALTER KING, Office of the "Journal of Gas Lighting," &c., 11, BOLT COURT, FLEET STREET, LONDON.

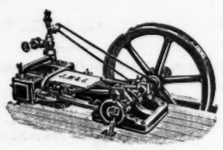
Fcap. Fol., 28 pp., 2 *Plates, and* 43 *Illustrations, Bound in Duplex Paper Cover.*
Price 2*s.* 6*d. net, post free.*

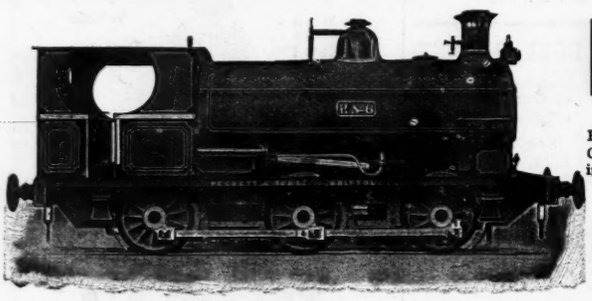
A DESCRIPTION
OF THE
ZURICH NEW GAS-WORKS.
By A. WEISS, Engineer of the Works.
Translated from the German for, and Reprinted from, the "JOURNAL."

London: WALTER KING, 11, Bolt Court Fleet St., E.C.

WILSON CARTER & PEARSON
LIMITED,
GAS COAL AND CANNEL FACTORS,
Supply to any Railway Station, or for Export, all kinds of Fuel for Gas and Other Purposes.
ADDRESS CHIEF OFFICES:
Temple Buildings, 50, New Street, Birmingham.

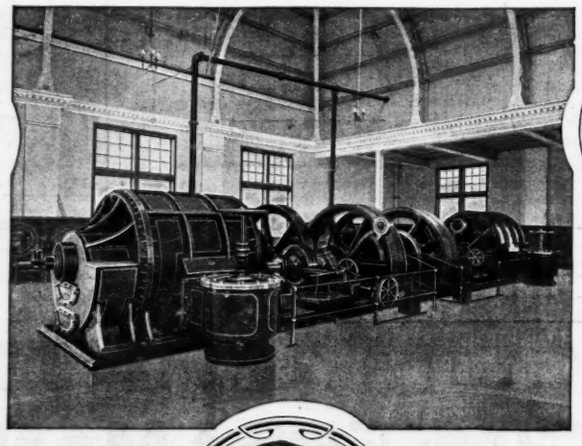
JAMES MILNE & SON, LTD.,
GAS ENGINEERS
MILTON HOUSE WORKS EDINBURGH.
LONDON. —— LEEDS. —— GLASGOW.





LOCOMOTIVES
LOCOMOTIVES of all Sizes and Gauges specially constructed for Main and Branch Lines, Contractors, Docks, Gas-Works, Collieries, Iron-Works, Brick and Cement Works, &c. Locomotives of various Sizes always in Stock, ready for immediate Delivery.
Photographs, Specifications, and Prices on Application.
PECKETT & SONS, Atlas Locomotive Works, **BRISTOL.**
Telegraphic Address: "PECKETT, BRISTOL."

R. LAIDLAW & SON,
LIMITED
GAS & WATER ENGINEERS,



SIMON SQUARE WORKS, EDINBURGH.

6 LITTLE BUSH LANE, LONDON, E.C.

TWO EXHAUSTERS EACH TO PASS 750000 CUB. FT. PER HOUR AT 60 REVOLUTIONS PER MINUTE DRIVEN BY TWO GAS ENGINES

AND INTERMEDIATE FRICTIONAL GEARING, ERECTED AT GRANTON GAS WORKS FOR EDINBURGH & LEITH GAS COMMISSIONERS

ALLIANCE FOUNDRY & ENGINEERING WORKS, GLASGOW.

BRAY'S "BAGBY"

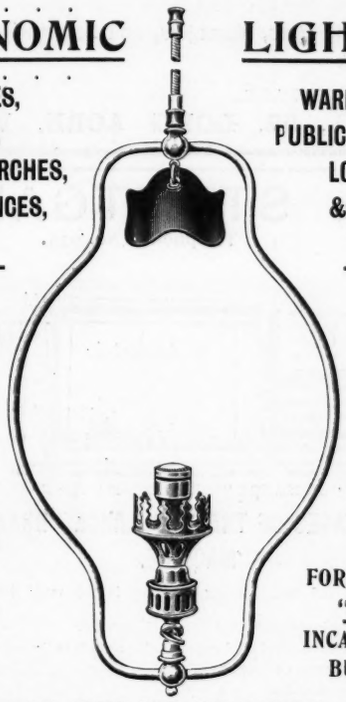
— ANTI-VIBRATING —

GAS-PENDANT

FOR ECONOMIC LIGHTING OF

STORES, FACTORIES, CHURCHES, RESIDENCES,

WAREHOUSES, PUBLIC BUILDINGS LODGES, &c., &c.



COMPLETE WITH THE "BRAY" INCANDESCENT BURNER, FLEXIBLE TUBE, &c.

WE RECOMMEND THE "BRAY" XXX DOUBLE WOVEN MANTLE FOR USE WITH "BRAY" INCANDESCENT BURNERS.

PLEASE SEND FOR PRICE LIST AND FURTHER PARTICULARS.

GEO. BRAY & CO., LTD., BAGBY WORKS, LEEDS.

THE THAMES BANK IRON CO.

UPPER GROUND STREET, LONDON, S.E.

SUPPLY FROM STOCK

CAST-IRON RETORTS

AND ALL KINDS OF GAS-WORKS APPARATUS.

SOCKET-PIPES FOR GAS OR WATER PURPOSES.
FLANGE PIPES FOR STEAM.

Sole Manufacturers of **LYON'S "PATENT" GAS-MAIN SYPHONS.**

AGENTS FOR

ATTERTON'S PATENT APPARATUS for CHARGING RETORTS.

STARTLING INVENTION!

Carborundum Bricks, Carborundum Crucibles, &c.

DR. ENGELS' PATENT

CARBORUNDUM COATINGS

For Lining **GAS-GENERATORS.**

For Lining and Repairing **GAS-RETORTS.**

For Metallurgical and Chemical purposes, Furnaces, and Firing Plants of all kinds.

The Fire-Proof Products Co., Ld.

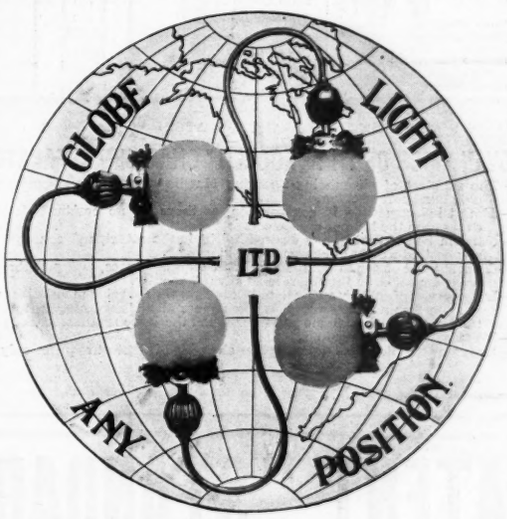
Representative: **Richard Cremer,**

CIVIL ENGINEER, WOODHOUSE LANE, **LEEDS.**

Globe Light.

THE ONLY PERFECT BURNER.

EASILY LIT. NO FLICKERING.



A Simple, Highly Efficient, and Durable Gas-Burner.

The most powerful and economical Light.

Can be fixed to any Gas-Fittings in existence.

GET A LIGHT SUPERIOR TO ELECTRICITY.

The Managing-Director of The Electrophone, Ltd., writes:

"As the lighting of our building is I consider the most effective in the Italian Exhibition, the smallness of the cost is amazing."

See our Stand No. 180 at the Ironmongery Trades Exhibition, at the Agricultural Hall, from July 12th to 22nd.

GLOBE LIGHT, LIMITED,

20, Regent Street, Waterloo Place,

LONDON, S.W.

"Invaluable to those engaged in lighting works."—ENGINEERING.

Now Ready. Twenty-Seventh Year of Issue. Revised to June, 1904.

GAS-WORKS DIRECTORY & STATISTICS,

FOR 1904.

With List of Associations and Alphabetical List of Chairmen, Engineers, Managers, and Secretaries.

Price, Cloth, 10s. 6d. Net.

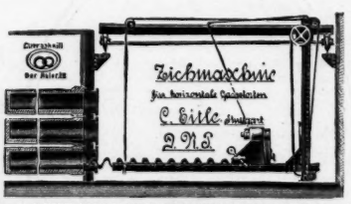
SEND FOR PROSPECTUS AND SPECIMEN PAGE.

LONDON: HAZELL, WATSON, & VINEY, LD., 52, LONG ACRE, W.C.

C. EITLE, ENGINEERING WORKS, STUTTGART.

Telegraphic Address: "EITLE, STUTTGART." Telephone: No. 635.

"KOBOLD" CHARGING APPARATUS.



"SCHLANGE" DRAWING MACHINE.

ADVANTAGES OF THE "KOBOLD" CHARGING APPARATUS.

1.—The simplest of all existing Charging Machines, as in charging there is only ONE shaft working.
2.—Almost indestructible in construction, as there are no combustible parts exposed to the heat of the Retorts.
3.—Uniform bed of coal of any desired height in the retort, and consequently any desired weight of charge may be inserted.
4.—Greater yield of gas in comparison with all other types, owing to the coal being deposited in the retort most advantageously.
5.—Least inrush of cold air owing to the close fit of the charging mouthpiece with the retort mouthpiece, with consequently practically no cooling of the retort, the least outrush of flame and smoke, and therefore smallest loss of gas.
6.—Smallest consumption of power.
7.—Most rapid working, as the complete charging of a retort requires only two pulls of a lever.
8.—May be set at any position in regard to height by either manual or motor power.
9.—Lowest cost to purchase; paying interest and redemption in about three years.

ADVANTAGES OF THE "SCHLANGE" DRAWING MACHINE.

1.—The simplest and best drawing machine in the world for horizontal retorts.
2.—Least time required to draw a retort (10-15 seconds).
3.—Most careful treatment of the lumps of coke, as well as the retort.
4.—Smallest consumption of power.
5.—Lowest cost to purchase.
6.—Most substantial construction, and consequently very low maintenance charges.
7.—Rapid and cheap working, consequently pays interest and redemption in a few years.

PATENT "STANDARD" PURIFYING GRIDS.

Orders received for fitting these Grids to 197 Purifiers.

RECENT ORDERS: Ilford (4); Barnet (1); Ticehurst (2); Gerresheim (3); Elbing (3), 2nd order; Kiel (3), 2nd order; Fuerth (4); Dresden (4); Anclam (4); Schmiedeberg (3); Osnabruck (4); and Dirschau (2).

CAPACITY OF PURIFIERS MORE LARGELY INCREASED.

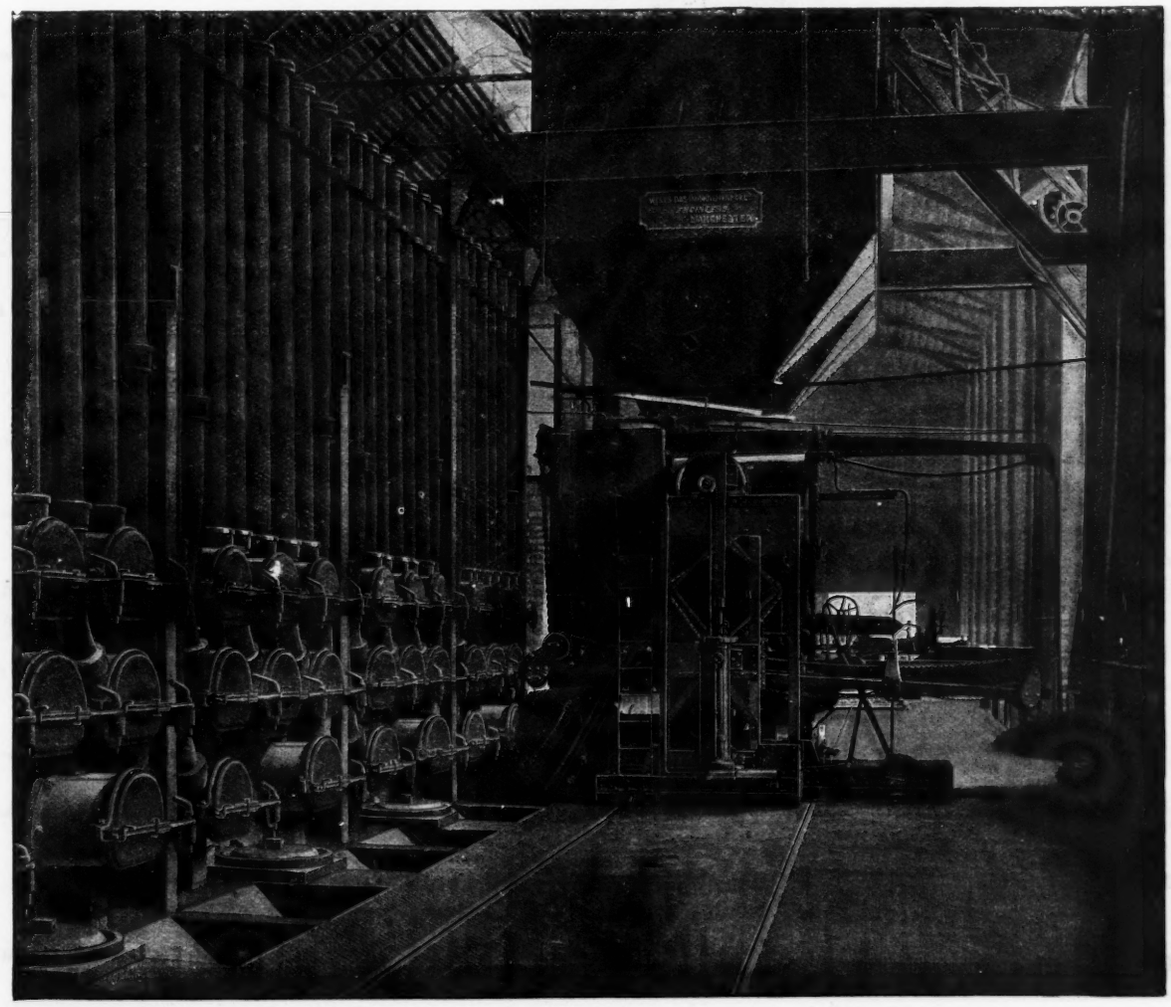
Pressure and Cost of Emptying and Filling more Largely Reduced than by any other System.

Figures from Users verifying this on application to—

KIRKHAM, HULETT, & CHANDLER, LTD. PALACE CHAMBERS, BRIDGE ST., WESTMINSTER, S.W.

WEST'S STOKING MACHINERY

COMPRESSED AIR DRIVEN
CHARGING AND DRAWING MACHINES;
COMBINED CHARGING AND DRAWING MACHINES; also
MANUAL CHARGING AND DRAWING MACHINES.



West's compressed Air Driven Charging and Drawing Machine, requiring only One Machine driver and one attendant to charge and draw the Retorts, attend to the Mouthpieces, and fill the Furnaces.

All classes of Coal can be efficiently dealt with by the West's Charging Machines, and the Retorts are charged evenly throughout with the full weight of Coal.

Retort-Houses fitted with West's Regenerator Furnaces, Stoking Machinery, and Coke-Conveyors reduce the cost of Carbonizing Coal to a minimum.

WEST'S GAS IMPROVEMENT CO., LTD.,

Albion Iron-Works, MILES PLATTING, MANCHESTER,

AND 104, QUEEN VICTORIA STREET, LONDON, E.C.

Manufacturers for America: RITER-CONLEY MANUFACTURING COMPANY, PITTSBURGH.

TELEGRAMS. "UNBEATEN" BIRMINGHAM.

TELEPHONE No. 815.

GAS WATER & STEAM TUBES

THE STAFFORDSHIRE TUBE CO. LTD.

AND FITTINGS

HEAD OFFICE

Edmund Street, BIRMINGHAM

GASHOLDERS OF EVERY DESCRIPTION.

SPIRAL GUIDED. — STANDARD GUIDED. — COLUMNLESS.

STEEL TANKS FOR GASHOLDERS OR OIL STORAGE.

WATER-TUBE CONDENSERS — OVER 130 IN USE.

JÄGER FITTINGS WHICH DOUBLE THE CAPACITY OF PURIFIERS.

WATER-GAS PLANT, CARBURETTED OR BLUE.

STEEL BUILDINGS, ROOFS, CHIMNEYS, PIPES.

EVERY REQUIREMENT FOR GAS AND WATER WORKS.

SAML. CUTLER & SONS, MILLWALL, LONDON.

No. 167.

Telephone No. 756 Bank. *Telegrams: "Robustness, London."*

Please Note **CHANGE OF OFFICES** from Rooms 388 to 390 Second Floor, to **ROOMS 279, 279a, 280, 281, & 282 FIRST FLOOR**

MANSION HOUSE CHAMBERS, LONDON, E.C.

INCLINES, HORIZONTAL, FLOOR LEVELS, GENERATORS,

AND REGENERATORS.

HIGH-CLASS

RETORT WORK

GUARANTEED.

GENERAL GAS AND WATER WORKS CONSTRUCTORS.

MAINLAYING.

Plans & Particulars—**J. & H. ROBUS, Engineering Contractors,** LONDON & GORING.

COAL TAR PRODUCTS.

Benzol, Toluol, Solvent Naphtha, Creosote Oils, Grease Oils, Carbolic Acid, Crude Creosote Salts, Granulated (Crude) Naphthalene, Sublimed Naphthalene, Anthracene, Refined Tar, Pitch, also Sulphate of Ammonia.

For Prices apply to the **SOUTH METROPOLITAN GAS COMPANY,**

Works: ORDNANCE WHARF, EAST GREENWICH, LONDON, S.E.

709, OLD KENT ROAD, LONDON, S.E.

Telegraphic Address: "METROGAS, LONDON."

IRONMONGERY EXHIBITION, AGRICULTURAL HALL, JULY 12-22.

THE LARGEST INCANDESCENT MANTLE MANUFACTURERS IN THE WORLD

20.000.000 YEARLY

SEND 30/- FOR ASSORTED SAMPLE GROSS

UNITED CHEMICAL WORKS
JULIUS NORDEN & Co
94 LEADENHALL St LONDON. E.C

20.000.000 YEARLY

SEE OUR STAND No. 21 IN THE ARCADE.

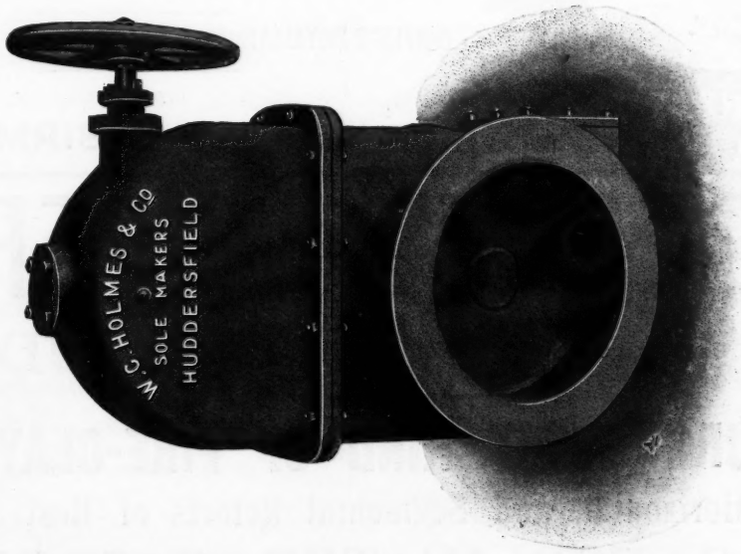
GENERAL HEATING & LIGHTING CO., LTD.,
(MOELLER'S SYSTEM),
26, VICTORIA STREET, LONDON, S.W.

MOELLER'S BURNERS
MAINTENANCE SIMPLIFIED.
Nothing to Corrode. Nothing to Choke.
Nothing to get out of Order.
Made in 4 Sizes consuming, 3, 4, 4½, and 6½ feet. In Brass or Nickelled.
PRICE LIST ON APPLICATION.

DOUBLE FACED VALVES

"WESTERN" TYPE,

MADE IN HORIZONTAL OR VERTICAL FORM from 6 in. to 48 in.



W. C. HOLMES & Co., HUDDERSFIELD.

Wrought-Iron

And Fittings & Accessories.

LAMBERT BROS., WALSALL,

MANUFACTURERS OF
WROUGHT-IRON TUBES & FITTINGS for GAS, WATER, & STEAM.
BRASS GAS-FITTINGS GAS-VALVES STEAM & WATER VALVES TOOLS. &c. AND OF
WARNER'S PATENT MARKET GAS STAND-PIPE.
LONDON: LAMBETH BRASS & IRON CO., LTD., 91 & 93, SOUTHWARK ST., S.E.

THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

MIDLAND AND WEST OF ENGLAND DISTRICT OFFICE: *6, CORPORATION STREET, BIRMINGHAM—Sole Agent: A. C. SCRIVENER.*
Telegraphic Address "WIGAN, BIRMINGHAM." Telephone No. 200.

LONDON DISTRICT OFFICE: *6, STRAND, LONDON—C. PARKER & SON, Sole Agents.*
Telegraphic Address: "PARKER LONDON."

JOHN BROWN & CO., LTD., SHEFFIELD,

Proprietors of

ALDWARKE MAIN, CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

ALDWARKE MAIN GAS COAL

Analysis: 12,600 Feet of 19-Candle Gas per Ton.
Value in Pounds of Sperm, 82C·20.

VERY FREE FROM IMPURITIES.

TELEGRAMS: "ATLAS, SHEFFIELD."

GAS ENGINEERS.

CONTRACTORS FOR, AND ERECTORS OF, ALL GAS-WORKS PLANT.

REGENERATORS, GENERATORS, AND DIRECT-FIRED RETORTS.

RESULTS GUARANTEED.

COMPLETE INSTALLATIONS OF HORIZONTAL AND INCLINED RETORTS

ADDRESS—

NEWTON CHAMBERS, CANNON ST., **BIRMINGHAM.**

MOBBERLEY & PERRY,

STOURBRIDGE.

MANUFACTURE EVERY KIND OF FIRE-CLAY GOODS,

Inclined, Horizontal, and Segmental Retorts of Best Quality.

SPECIALS FOR WATER GAS PLANTS.

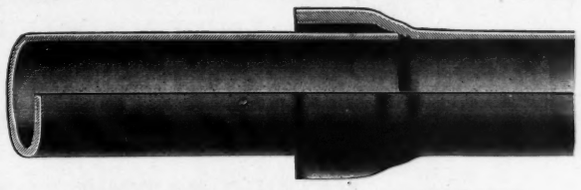
LARGE STOCKS KEPT.

BOWENS' Ltd. Successors,
STOURBRIDGE.

MANUFACTURERS OF
BEST FIRE-BRICKS; INCLINED, HORIZONTAL, and SECTIONAL RETORTS; LUMPS, TILES, &c., of every description.
ESTABLISHED 1860.

CLAYTON SON & Co LTD
LEEDS
MAKERS OF THE LARGEST GASHOLDER IN THE WORLD ALSO
THE ORIGINAL MAKERS OF
SPIRAL GUIDED GASHOLDERS
MAKERS OF ALL KINDS OF
STRUCTURAL IRON & STEEL WORK. STEEL FRAMED BUILDINGS
ROOFS RETORT FITTINGS
PURIFIERS RETORT LIDS
ANTIFREEZERS for Gasholders
STEEL TANKS
OF ALL SIZES
MAKERS OF THE LARGEST IN
THE WORLD.
GASHOLDERS
OF EVERY DESCRIPTION & SIZE.
HIGH CLASS BOILERS FITTED WITH DEIGHTON'S PATENT CORRUGATED FLUES.
Telegrams "GAS LEEDS." London Office 60 Queen Victoria St E.C.

MANNESMANN



WELDLESS STEEL SPIGOT AND FAUCET PIPES

In Long Lengths up to 35 feet for
GAS & WATER MAINS.

A Perfect Substitute for Cast-Iron Mains.

—THE—
BRITISH MANNESMANN TUBE Co.,
LIMITED,
110, CANNON STREET, LONDON, E.C.

R. & J. DEMPSTER, LTD.,

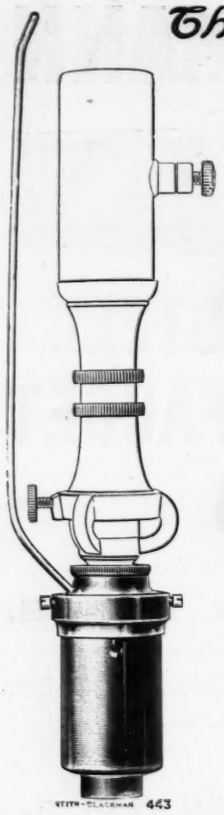
INCREASED CAPACITY
WITH
REDUCED PRESSURE.
LONGER CHARGES.
ORDINARY
GRIDS.

IMPROVEMENTS IN PURIFIERS.

WITH
or WITHOUT
WATER LUTES.
PATENT RUBBER
FASTENING.
SIMPLE VALVES and PIPES.

Write for Particulars.

MANCHESTER.



Automatic Bye-Pass.

The **KEITH LIGHT.**

INTENSIFIED INCANDESCENT GAS.

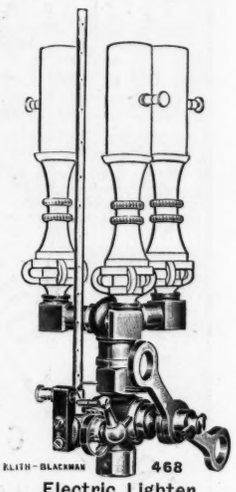
1600 INSTALLATIONS NOW IN USE.

KEITH'S PATENT AUTOMATIC BYE-PASS

places Gas on an equal footing with Electricity as far as Lighting and Extinguishing are concerned. *For full Particulars see 1904 Catalogue.*

KEITH'S PATENT ELECTRIC LIGHTERS

are made for single burners or clusters of burners. Simple in construction, certain in action. Save in bye-pass gas their own cost in six months. Suitable for both High and Low Pressure Gas. Particularly approved of by Insurance Companies.



Electric Lighter for Cluster.

Patentees and Manufacturers:

JAMES KEITH & BLACKMAN Co., Ltd., 27, FARRINGDON AVENUE, LONDON, E.C.

CLAPHAM BROS., LTD., KEIGHLEY.

ESTABLISHED OVER 60 YEARS.

SOLE MAKERS OF

Laycock & Clapham's Patent **"ECLIPSE" WASHER-SCRUBBER**

Clapham's Patent **"ECLIPSE" WATER-TUBE CONDENSER**

Clapham's New Century Cover for Dry-Lute Purifiers with Patent

"ECLIPSE" JOINT AND RAPID AUTOMATIC FASTENERS.

MAKERS OF ALL IRONWORK—

for Carbonizing Plants, for Inclined or Horizontal System, Valves, Mains, Lamp-Columns, Tanks, &c.

London Representatives: Messrs. JONES & YOUNGER, Chesterfield House, 98, Gt. Tower Street, E.C.

Printed for WALTER KING by King, Sell, & Olding, Ltd.; and Published by him at 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, July 12, 1904.